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Multi-Tasking

UniFLEX is a true multi-tasking operating system. Not only may several users run different programs, but one user may run several programs at a time. For example, a compilation of one file could be initiated while simultaneously making changes to another file using the text editor. New tasks are generated in the system by the 'fork' operation. Tasks may be run in the background or 'locked' in main memory to assist critical response times. Inter-task communication is also supported through the 'pipe' mechanism.

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The design of UniFLEX, with its hierarchical file system and device independent I/O, allows the creation of a variety of complex support programs. There is currently a wide variety of software available and under development. Included in this list is a Text Processing System for word processing functions, BASIC interpreter and precompiler for general programming and educational use, native C and Pascal compilers for more advanced programming, sort/merge for business applications, and a variety of debug packages. The standard system includes a text editor, assembler, and about forty utility programs. UniFLEX for 6809 is sold with a single CPU license and one years maintenance for $450.00. Additional yearly maintenance is available for $100.00. OEM licenses are also available.

FLEX™

UniFLEX is offered for the advanced microprocessor systems. FLEX, the industry standard for 6800 and 6809 systems, is offered for smaller, single user systems. A full line of FLEX support software and OEM licenses are also available.

technical systems consultants, inc.
Box 2570, West Lafayette, IN 47906
(317) 463-2502 Telex 276143

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'68'

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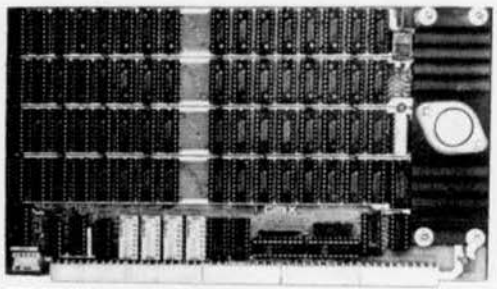

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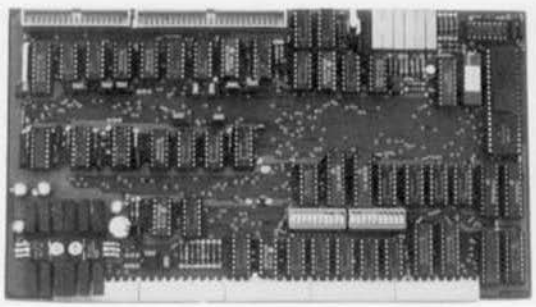

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SEE GHOST AD PAGES 35, 43, 46, 47, 48, & 56

BASIC09™ has a dual personality.

One craves meat-and-potatoes BASIC. The other prefers Programme ala Pascal.

Some people say BASIC09 is really a PASCAL in disguise, others say it's still BASIC. You'll understand this delightful dilemma when you look at both versions of the "bubble sort" program shown below: both can be run by BASIC09. The program on top is unstructured and hard to understand, but it's traditional BASIC. The program on the bottom is well-structured and easy to follow, a virtue of PASCAL. With BASIC09 you can program either way, or mix the best of both. It's like getting two languages for the price of one.

SORT AN ARRAY
IN ASCENDING SEQUENCE

```
90   DIM A(5)
100  I=5
110  IF I=1 THEN 200
120  FOR J=1 TO I-1
130  IF A(J)<=A(J+1) THEN 170
140  T=A(J+1)
150  A(J+1)=A(J)
160  A(J)=T
170  NEXT J
180  I=I-1
190  GOTO 110
200  RETURN
```

```
DIM array(5)
outer=5
WHILE outer>1 DO
  outer=outer-1
  FOR inner=1 TO outer
    IF array(inner)>=array(inner+1) THEN
      temp=array(inner+1)
      array(inner+1)=array(inner)
      array(inner)=temp
    ENDIF
  NEXT inner
ENDWHILE
RETURN
```

Makes programs better

BASIC09 has five kinds of loop structures: WHILE . . DO, REPEAT . . UNTIL, LOOP . . ENDLOOP, FOR . . NEXT and IF . . THEN . . ELSE. If one of the five built-in data types (byte, integer, real, string, and boolean) doesn't suit the problem, you can make a new one of your liking with the TYPE statement. Need a tree, linked list, or symbol table? Complex non-rectangular data structures using any combination of data types are easy to define. Modular programming breaks down large programs to smaller, more manageable elements. BASIC09 lets you create independent program modules called "procedures" with local variables for recursion plus parameter passing to any other BASIC09 or machine language procedure. There is a complete set of statements for device-independent sequential or random I/O, plus a superlative PRINT USING system.

Makes programs faster

No full-feature BASIC for any 8-bit microprocessor is faster than BASIC09, because it is an interactive compiler. As each program line is entered, it is instantly compiled to a smaller, faster form. Because BASIC09 automatically converts programs back to original "source" form for listing, it is as friendly and easy-to-use as traditional interpreter BASICs. Each procedure can be independently compiled to position-independent, reentrant, ROMable format. Microware® developed a new ultra-fast 9-digit-accuracy floating point math system just for BASIC09. And if that's still not fast enough, there's BYTE and INTEGER arithmetic.

Features that make programs easier to write

The compiler is integrated with a full-feature string AND line-number oriented text editor. If you make a mistake, BASIC09 tells you instantly. String-oriented commands such as search, change, change all occurances, delete, and insert can be used on programs with or without line numbers. There's an automatic line renumbering function too.

Features that make programs easy to test

Debugging often takes longer than writing a program. That's why BASIC09's integral high-level debugger sets it apart from all other compiled OR interpretive languages. The TRACE command shows you each statement executed in BASIC form, plus the result of any expression evaluation. STEP lets you run one or more statements at a time. LET and PRINT allow you to examine or change the values of variables, by name. STATE lists procedure calling order. And there are nine other debug commands. If you need to correct a program, you can edit, recompile, and rerun it in seconds.

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Does timesharing on a small system make sense?

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The convenience of an advanced operating system

Sophistication does not require complexity. Many OS-9 users say that it is actually easier to use than the older 6800-type operating systems. Consider how easy it is to run multiple programs: to run a program you just type its name and hit 'return.' To run a program as a separate job, you type its name, an '&' character, then hit return. The program runs as usual, but OS-9 comes back immediately and is ready for your next command. Simple commands let you see each program's status, set its priority, or abort it.

The file management system has fast, byte-addressable random-and sequential-access files. The tree-structured multiple directory system lets you create separate disk directories for each user, project, or application. Command line I/O file redirection means you specify what device and/or files a program will use when you run it, not when you write it.

Efficiency and hardware versatility

No other operating system can run on such a broad range of hardware: the overall RAM requirement for Level One is 32K to 56K RAM. Memory utilization is superlative because OS-9 lets multiple tasks "share" the same reentrant program. For example, if two users run BASIC09, only one "copy" is actually loaded into memory. The Level Two version of OS-9 can utilize up to a megabyte of memory on systems having memory management hardware (both versions come with complete timesharing support).

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FOR THE 6809

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By Charles (Chuck) Eaker, Ph.D

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See Review in July 80 68 Micro

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See Review in August 80 68 Micro — PRICE $34.95
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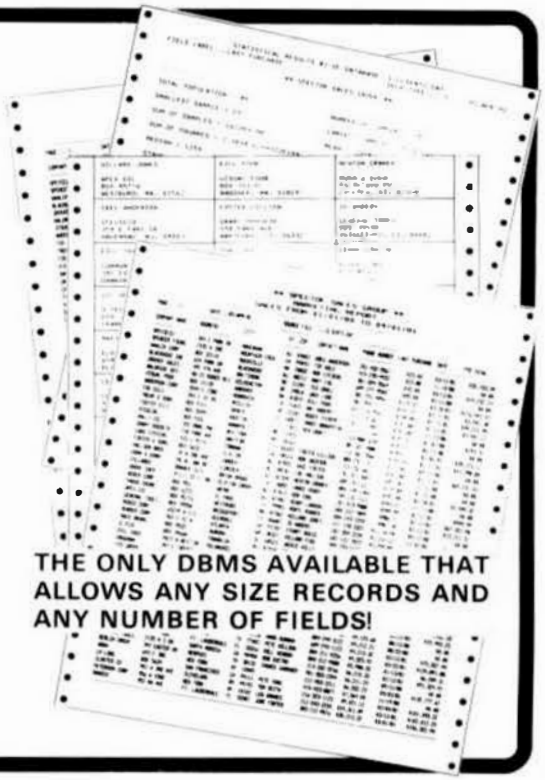

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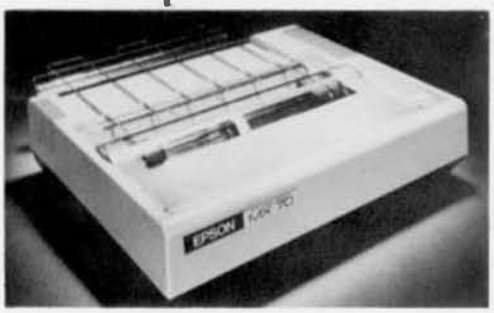

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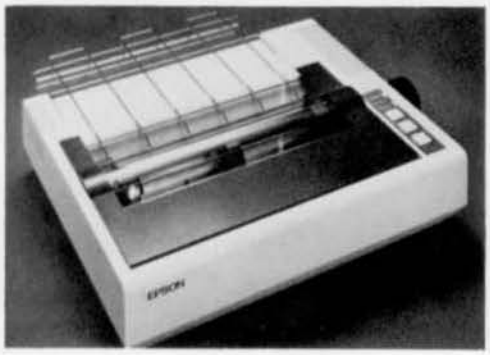

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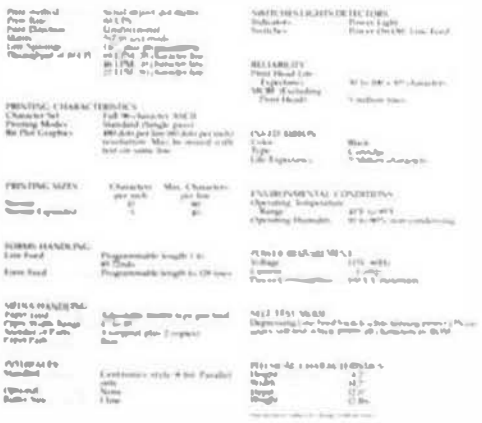

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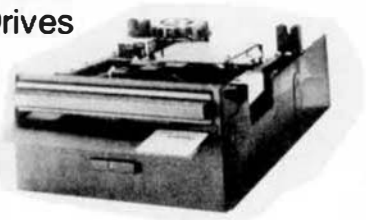

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FLEX User Notes

BY: RONALD W. ANDERSON
3540 STRUBRIDGE COURT
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SPELLING LESSONS

Programmers are no different than people in other professions when it comes to spelling. (Lousy). Here are a few of my unfavorite maulings of words found commonly in source listings. The word is mnemonic pronounced nemonik, e as in men o as in on i as in pick, it is not numonic, nor is it mnumonic. It is not pronounced newmonik as it would have to be if it were spelled either of those wrong ways. The word Parameter is frequently abbreviated in a comment. Many programmers like PARMS for that. It should be PARAMS or PAR'MS with the appostrophe to indicate the letter left out. When a programmer can't think of more examples for his comment, he ends it with a Latin word meaning and so forth. The word is etcetra, and the abbreviation is etc. and not ect. I write this, so I try a little harder to spell things correctly, though I'm sure that now I will receive 100 letters pointing out that I make errors too! I really don't think I'm 'perfek' either, just trying to upgrade programmers in general. Might as well be professional about it while we're at it.

SOME FURTHER THOUGHTS ON FORTH

Some of you are probably not interested in FORTH, and are groaning at the thought of more on the subject. I promise to be brief and then drop it. A recent issue of Dr. Dobbs Journal contains an excellent analysis of FORTH by H.T. Gordon who wrote the articles comparing instruction sets of the major Microprocessors in Kilobaud Microcomputing last year. He admits that FORTH is new to him, but has some interesting observations. Since it took me a couple of weeks of thinking about what he said before it really sunk in, I will pass my observations along to you, probably considerably modified by what I read in Mr. Gordon's article. I think the best analogy would be to say that Forth is to BASIC as the Z-80 instruction set is to the 6809 instruction set. Another way to put it is to say that FORTH is to BASIC (Pascal, Fortran, Cobol, whatever you like) as English is to Spanish (or many other languages). That is, English is a collection of scraps of many other languages, and is very IRREGULAR. Spanish on the other hand has much simpler rules (each of the vowels, for example, has only ONE pronunciation). Similarly, the 6809 instruction set is REGULAR. Z-80 proponents pooh the 6809 because it doesn't have as many instructions. While we 6800-09 users have a single BIT test, for example, (BIT A #$00010000), the Z-80 user has the advantage of a separate distinct instruction for testing EACH bit. Is that an advantage?

To persue the point with FORTH, a few examples come to mind. (Both precipitated by Mr Gordon's thoughts.) Take, for example, just two instructions in FORTH: SWAP and ROT. SWAP swaps the two top 16 bit values on the stack. That is equivalent to "pulling out" the second item and placing it on top. ROT "pulls out" the third item and puts it on top. Why not therefore have a whole class of REGULAR instructions to "pull out" the N1th value and put it on top of the stack (2TOP, 3TOP, 4TOP) etc. Wouldn't that be easier to learn? There is another group of instructions that "copy" an item on the stack to the top of the stack without removing it from where it was. These are DUP, which copies the top item above itself, and OVER which copies the second item onto the top, (over the first item). Again, there is regularity here. Why not a regular set of instructions such as 1COPY 2COPY etc. Better yet, the size of the irregular instruction set could clearly be reduced by letting the number be an argument put on the stack first (3 TOP, 2 COPY).

Taking this approach just a little further, FORTH has the ability to use double precision arithmetic (32 bits or 4 bytes). It would be ideal to have this feature be a "Modal" command, ie. the instruction DOUBLE or some such could set FORTH to the double precision mode, just as HEX sets it's I/O conversion routine to accept and output Hexadecimal numbers. It doesn't work that way, however, and instead, the instruction set is more than doubled to accomodate this feature. Multiply is indicated by '*' and double precision multiply by 'D*'. Further, there is allowed Unsigned arithmetic using 'U*' for multiplication. Of course it is up to the programmer/user to have double precision numbers on the stack before using 'D*'. There is a similar set of instructions for divide (/ M/ MOD /MOD), a set for add (+ D+) and a set for outputting the results, '.' for print the single precision number on the stack, 'D.' for double precision, 'U.' for unsigned single precision, etc. To add to the complication, the FORTH users have defined a standard "pronunciation" of their "words". '.' is not Print, it is "dot". '*' is not Times or Multiply, it is "star". Putting a variable name in a definition gets the ADDRESS of the variable on the stack. Putting a constant name in a definition gets the CONTENTS of the constant (its value) on the stack.

What I am trying to say is that FORTH looks a little like the old (more truth than joke) saying that a Camel is a Horse put together by a committee. It seems that it just sort of grew. There appears to be no master plan in the Standard words. The point of this whole discussion is not to knock the basic idea of FORTH. It is still rather intriguing to be able to write a whole program in a single line. The point is that the basic Standard words of FORTH could be greatly simplified, "regularized" so to speak to make FORTH more managable. Unfortunately (in my opinion) it is the avowed purpose of the FORTH Interest Group to keep FORTH "Pure" and to keep all implementations of it down the same path. To quote them "No restrictions are placed on cost but we expect faithfulness to the model." This statement follows one indicating that the recipients of their manual will customize FORTH for particular computers, and that they may sell their efforts. FORTH is a language of EXCEPTIONS. To learn it is not to learn the grammar or the syntax, but to memorize each instruction and what it does! This would not have to be the case.

TEXT EDITORS AND PROCESSORS

I was impressed by the review of Stylograph in the October issue of '68'. (Yes, I read it too). We therefore bought it for our company. I have had some chance at hands-on use of it and I am both very well impressed and a bit disappointed at the same time. The nicest thing about it is that it is very simple to learn. I had it down pat in about 4 hours. It is most impressive to see your text appearing on the screen just as it will appear in final form. The formatting is immediate and no separate Text Processor is required. My ADM-3 running at 19.2K baud on the 6809 system is transformed so that it looks very much like a memory mapped video system. (I know, there are some of you out there who think 1200 baud is too fast because you can't read the screen that fast, but the screen oriented editors and formatters have to rewrite the whole screen or major sections of it when you insert or delete a word for example).

We were just a tiny bit disappointed over a couple of things that Stylograph doesn't do as well as the old TSC Editor. It does not have an overlay mode. That may not at first seem important, but with some other screen oriented editors, you may change a 'S' to an 's' by putting the cursor over the 'S' and typing 's'. To do it in Stylograph you must position the cursor over the 'S', type CTRL-s (for single character delete), type 'i' to get into the insert mode, type 's' to insert it, and type Escape to leave the insert mode. That is a

penalty of 4 keystrokes to change a single character, while in the overlay mode only 1 is required.

Unlike TSC's Editor, Stylograph won't let you edit a file longer than will fit in its text buffer. That may not be any problem to you at all, if you have a 6809 system with 56K memory and are not trying to write large programs in Assembler. Long texts may conveniently be divided into "chapters", and the 30K+ text buffer will hold quite a few pages of text.

There are a lot of very nice features. You may insert a CR anywhere in the text, splitting a line, or may remove one, concatenating lines. You may type endlessly without regard to line lengths or carriage returns. In addition, you may save and load files to Stylograph at will without exiting the editor. You may use multiple loads, and a file may be loaded at any point within the present text in the buffer. This makes it easy to load, for example a standard Format file (TSC calls it a MACRO file), then enter your text. The format file will contain the margin set-up, page length, and the instructions that set up the header and footer for each page of text. This avoids one problem that always bothered me with TSC's Processor. There could be only one file on the disk, named MACRO.TXT, and you could therefore not have a Letter macro, a Report macro, etc. on the same disk. Stylograph will reformat the text before your eyes when you change a line length command. Incidentally, formating commands are placed in the text just as for the TSC Processor. There is, however, a command that hides them so that the screen looks exactly like the finished printed copy. Formatting commands are very similar to TSC's, though slightly less in number. The fact that you can see the actual format makes some of them unnecessary. You can insert a footnote because you can see where the page will end, for example.

To summarize, we were impressed with the capability of Stylograph as a word processing tool. It is not as useful in preparation of a program source text because of the missing overlay feature. You cannot, for example go add a label to a source text by putting the cursor in position and typing it in. If you or someone in your family or company does a lot of writing, such as instruction manuals, sales letters, price quotations, sales and work order summaries, etc. you should have Stylograph. The price is good too!

A PUZZLE FOR THE ASSEMBLER GROUP

Recently, I was assembling a large program that I had been modifying, and I suddenly got some obviously wrong results. The listing here is a little test program I wrote that reproduces the screwy results. There is a FATAL error in the program. The 6809 assembler does not even detect the fact that an error has occurred. The 6800 assembler does a little better, and does indicate the detection of an error, but neither print any error messages within the text of the program. This is not a bug in the assemblers, unless you consider their failure to flag the error a bug. I'm wondering how many of you can see just how dumb I am. Remember that the problem was a bit more obscure in the 60 page program that I was working on. The listing here will assemble without changes in either a 6800 or 6809 system. This little error threw me for several hours, and I finally had to sleep on it. The next morning, things clarified themselves, and I was able to cure the problem. Hint— by adding one equate and removing one label, the problem may be cured.

A CHALLENGE

Here's one for you BASIC programmers out there, (or Pascal, Fortran, etc.) If you have an interpreter or compiler capable of 9 digit or so floating point arithmetic, you can participate in this one. There is no prize but the satisfaction of seeing your name and program in print. I've recently been working on some approximations for Trigonometric functions. The well known infinite series calculation for the Sine of an angle works well but requires too many terms to be practical for large angles. A very large angle may be reduced to less than 360 degrees by consecutively subtracting 360 degrees until the result is between 0 and 360. The sine of an angle between 180 and 360 degrees is -SINE(angle-180). The sine of an angle between 90 and 180 degrees is SINE(180-angle). These relationships allow reduction of any angle for the purpose of calculating the sine to the range of 0 to 90 degrees or 0 to PI/2 radians. If we limit the value of the angle to this range, the infinite series "converges" much more rapidly to an accurate value for the sine. It is possible to neglect the smaller terms of the series and just stop somewhere along the way. The series is:

SIN(x)= X - xpwr3/3! + Xpwr5/5! - Xpwr7/7! + Xpwr9/9!
****

The '!' stands for "factorial" and means the number times itself -1 repeated until 1 is reached. Ie., 5! = 5 * 4 * 3 * 2 * 1. We can therefore do the numerical part of the calculation and arrive at SIN(X)= 1*X - .1666666* XCTRL-3 + .00833333* xCTRL-5 etc. You may note that the multipliers (called coefficients) of each term decrease rapidly. If X is small, as it is for angles between 0 and PI/2 (1.5708 approximately), the later terms don't contribute very much. You might imagine, however that if you threw away the later terms, perhaps some "distortion" of the early ones might produce a better approximation, which indeed is the case. I have some results for a very brief approximation, using only the X and Xpwr3 terms:

SIN(X)= .98535* X - .14160* Xpwr3

This produces a maximum error of around 0.5%. By adding another term, it is possible to get a very large reduction in error. I found the following to produce good results:

SIN(X) = .99965* X - .16558* Xpwr3 + .007477* Xprw5

The maximum error produced by this approximation is approximately .008%, giving an improvement of over 60 times in accuracy. The problem is to write a program to refine these approximations, given something in the ballpark. I have done one for the first approximation above, and it is nearly optimum. The second was found by "systematic trial and error". What is required is to write a program that will use the approximation to calculate the SINE for, for example every 0.1 radian from 0 to 1.6, and compare the results with the actual SINE. TSC Extended BASIC calculates sines to about 14 digits and is useful for testing approximations. The worst case error for this set of coefficients is stored, and one of them modified and the approximation redone. If the worst error is smaller this time, the coefficient just changed is better than the previous value. Based on my experience with the first approximation above, having written a rather inefficient program to do the search, it should be possible to optimize the coefficients in turn, and repeat the process until the best are found. The problem then is to write a program to do just that. An efficient program will at first take large increments in the coefficient, until the error begins to rise, having gotten past the optimum, then back up with smaller increments, etc. I suggest starting with the coefficients for the infinite series terms, and seeing if you can find the optimum ones for a four term approximation (through the XCTRL-7 term). You will see that the modified coefficients give a very much better approximation than the "correct ones".

If you have the book "Some Common BASIC Programs by Borchers and Poole, you might look at the program on page 151 called "Nth Order Regression" which solves simultaneous equations to compute the best coefficients for this sort of approximation. If you input the values of X and SINE(x) to this program, you may specify the "order" of the solution and it will find such coefficients for you. You will find that truncation of the series causes the even order terms (Xpwr2, Xpwr4, etc.) to produce some improvement, though the coefficients for them are very small compared to the odd order terms. You might try running this program and comparing its results with yours. I will include here a program for evaluating the approximation and the error, given the coefficients, as a starting point for you.

OMEGASOFT PASCAL

My company recently bought the OmegaSoft Pascal compiler. We purchased the whole package including the Source listings of the Runtime Package. We were immediately impressed with the Source code for the Runtime. It is well written and includes excellent comments. We had one operational bug due to having a different version of FLEX9 than the one used to test the compiler, and we notified OmegaSoft's Bob Reimiller. Bob has taken steps to make that function independent of FLEX version and corrected the problem. We later found that the Trig functions gave us erroneous values for some angles and pointed this out to OmegaSoft. We were sent corrections in a few days, with assurances that these have been incorporated in all later copies of Pascal. About ten days later we received two new disks with these corrections and several other improvements in the line of reduction in the Assembly and load time.

Though our confidence was slightly shaken by the initial bugs, the very fast response and their elimination have restored our faith in this compiler. A well written manual is supplied. Pascal is available in FLEX9 and Motorola MOOS (Exorciser) versions, both of which are documented in the manual.

This Pascal takes a slightly different approach to implementation than the previously available versions which have been P-code compilers that require an interpreter at runtime. This compiler generates assembler source code. OmegaSoft has prepared an assembler similar to Motorola's relocatable one for use in assembling this source code. A relocatable object file is produced, which may then be loaded by the use of a linking loader also supplied. If the process sounds like a lot of steps, it is, but OmegaSoft has gone to great lengths to simplify the process. You first prepare your Pascal source text file. This is compiled by Pascal to the assembler source file. OmegaSoft has included a special DEBUG package that includes a very limited assembler and the entire runtime library. This package allows a single pass, single command assembly of the program. At this point, the program may be run, breakpoints may be set, contents of variables examined. At compile time, debug parameters may be included in the assembler source. These appear as comments, and are such things as line numbers for the breakpoint routine. The debugger is not the ultimate in features, but it does allow a quick compile and test of a program. I noted with interest that the program when run in DEBUG runs just as fast as it does in the final form. DEBUG Assembles the program to memory only, and no object file is created when using this mode.

When the Pascal Assembler source (OmegaSoft uses the extension .CO for compiler output) has been debugged, the next step is to put it in final form. You may go back and recompile it leaving out the DEBUG parameters. You may include your Pascal source code as comments in the Assembler source. At this point, you use a utility (written in Pascal) called BUILDIT. BUILDIT asks you where you want the system and user stacks, and where you would like the finished program to load. It generates the EXEC file that does the remainder of the Assemble and load process. (OmegaSoft, keeps with the Motorola MOOS terminology and calls the utility CHAIN that does the same thing as FLEX EXEC utility.) When BUILDIT has finished generating the files, you simply type CHAIN FILENAME. This system is built around using the same filename for all the files associated with the program, and again in the Motorola tradition, different two letter extensions for the various command and intermediate files. As the program is assembled, the runtime library is scanned and only those modules that are actually used or called by the user program are loaded and linked. This approach minimizes the size of the final object code which ends up in a file with the extension .BIN.

Package size for my favorite test program "Prime" is only 2200 bytes, compared to the total of 6500 for Lucidata Pascal. However, this package generated about 700 bytes for my user program. This indicates that Lucidata should generate less code for a very large program, and indeed, I found both to generate very nearly the same number of bytes for a very large program that I now have running in both. The Pascal source text is about 26 pages, and both produce about 20K of object including the respective runtime packages. One could conclude that OmegaSoft favors small programs and Lucidata large programs.

Concerning execution speed, OmegaSoft runs the primes about twice as fast as Lucidata (4 seconds). What about compile time? My 20K program Compiled in Lucidata in about 7 minutes. Total compile, assemble, load time in OmegaSoft was 16 minutes. (Compile 4, Assemble 10, Load 2). This is a little misleading, since the final binary file includes all the runtime routines. With the p-code compiler, the runtime package must be loaded in addition to the compiled user program. (I'm just trying not to compare apples and oranges.)

OmegaSoft has built in some interesting features. Variables may be placed at an absolute memory address. This means that you may talk to a parallel port by assigning a variable to the port address, and then assigning a value to that variable or reading its value. Hex values are supported. The floating point package produces 7 digit precision. The Trigonometric functions are all good to at least 6 places. Records and files OTHER THAN file of Character are not supported. There are several string manipulating functions that are extensions of Pascal. These allow the ease of string manipulation that is obtainable with BASIC. Functions supported are STR, VAL (with variations for Integer, real, and Hex conversions), LENGTH, SUBSTR, and INDEX. The first of these are equivalent to the similarly named functions in TSC BASIC. SUBSTR is equivalent to BASIC MID$, and INDEX is equivalent to BASIC SUBSTR. It is not hard to write special FUNCTIONS and PROCEDURES in Assembler and link them to the user program. It is also possible to include any often used procedures you may have written, in the runtime library. If for example, you write procedures for Polar to Rectangular coordinate conversion and the inverse, you could put these in the runtime library. Your program would define them and flag them as external. The loader would load them to resolve the external reference generated by your program.

The compiler contains some optimizing features. When compilers translate a line at a time of source code they sometimes produce code that is obviously redundant. The optimizer handles these

situations such as PSHU A followed by PULU A, by deleting both instructions. It looks for other patterns of instructions and replaces them with simpler instructions that do the same thing. Though the number of cases checked for is at this time rather small, it is likely that these are very common in the output of the compiler, and the improvement must be rather significant.

One item that should be mentioned here is the error handling during compile. OmegaSoft issues error messages with the error number and a brief description of the detected error. This compiler does not abort when an error is detected, which is a help in detecting multiple errors in a single pass, but sometimes an error can get the compiler "out of sync" and it will generate a few dozen meaningless error messages, scattered throughout the program. When this happens, the best approach is to fix the first error and try another compile. Since the compile step is fast, this is no great chore. Overall, there is probably more to be gained by allowing the compile to complete itself in spite of errors than to abort it. In general, some of the errors are "bypassed" and don't get things out of sync so that multiple errors may be found and corrected in one pass. When an error message is issued, an up arrow on the line below the error line points to the spot where the compiler "thinks" it has found an error. The program may be compiled without listing, and in that case, only lines with errors and the corresponding error messages are listed to the terminal or printer. The P.CMD works with the compiler, though the use of the CHAIN command file turns the print mode off. It is easy to go in and edit the CHAIN command file to insert the P, required to get, for example, the assembler pass or the load map to output to the printer.

The system has been made very easy to use, and the results are impressive. We have noted a couple of very minor syntax differences between OmegaSoft and Lucidata. OmegaSoft requires single quotes around strings and Lucidata double quotes. The Jensen and Wirth standard calls for the single quotes. There is a slight difference in the handling of input of a character. Lucidata accepts a character as it is struck and returns it immediately. OmegaSoft on READ (ch); puts the character in a buffer and waits for a CR before returning the character to the Pascal program. Two of us read the description in Jensen and Wirth and couldn't decided which is correct, though we think perhaps OmegaSoft is more likely as defined. We needed the other mode, however, since we were inputting cursor control characters and bumping the cursor around the screen in our Pascal program. We wrote a three line Function called CREAD (for Character READ) in assembler and linked it to our program. We therefore are able to input in both modes. The program is included here to show the simplicity of adding an external Function.

```
     NAM SCREEN
     OPT REL

     XDEF CREAD

GETCHR  EQU $CD18

CREAD   JSR GETCHR
     PSHU A
     RTS
     END
```

Within the Pascal program, the function is declared:

```
FUNCTION CREAD : CHAR ;
  EXTERNAL;
```

The function is used as below assuming that DIRECTION is a variable of the type CHAR that has been declared at the start of the program. Note that no argument is passed to the function, but the type of the value to be returned is specified as CHAR. This sets up Pascal to expect a single byte to be returned from the function. The byte is pushed on the user stack by the Assembler routine.

```
DIRECTION := CREAD;
```

In summary, this is an excellent product with a number of extensions and a few omissions. The extensions make this PASCAL more "real world" and the omissions are not serious. The next release is due later this year. OMEGASOFT has promised a liberal update policy.

Omegasoft
PO Box 70265
Sunnyvale, CA 94086

Price is: PASCAL Compiler System $215.00
Source code for Runtime package $50.00 additional.

Review by: Ron Anderson

BACKUP

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BACKUP

By Derek Gitelson

Backing-up is a concept and a procedure. Any well run computer shop backs-up all data and programs on a regular basis. Many of the large computer users even go so far as to have an alternate computer to use if their main one goes down. The idea of maintaining a backup is to prevent total loss of data and programs if something disasterous happens to your system. For example you are running a program that writes to your system disk and it unexplainedly writes all over your DOS file. So as a matter

of course you recover your DOS and whatever other files you considered important from your back-up disk. Or did you neglect to make a back-up?

If you're like me, things like that tend to get overlooked and suddenly you find yourself with only the 6 month old version of that all-important program you need. I tended to overlook the backup process because of the hand-work required to do it. (Read the directories and copy only the new versions of programs to the backup disk.)

To reduce the problem, and hopefully make backing up more regular, and automatic I wrote a program to do 90% of the work for me. The program scans each disk as it is put in drive 1 and if it finds a file on the disk that has a later date of creation than the date on the corresponding file on the backup disk in drive 0 the file is copied to drive 0. If the file does not exist on drive 0's disk, you are asked if you want it backed up and if you answer yes the program does so. The program, as written, does not backup files with .BIN, .BAK, .SYS, or .CMD extensions. This is because all my .BIN files were created from .TXT files, which are backed up; all .BAK files are already older than the .TXT which will be backed up; and all .CMD and .SYS files are from my system disk, of which I have several copies, or are from .TXT files as the .BIN files are.

The program is written in STASM09 (see ad on page 44 in the December 1980 issue) but may be easily translated to straight 6809 assembly language. After assembling the program, copy it with a .CMD extension to your backup disk. Place the disk in drive 0 and then sequence the disks you wish to back-up through drive 1. As each disk backup is completed the program will request another or allow you to terminate. If you have your printer file on the backup disk and call BACKUP with the P option it will print each file name as it is copied (if you don't use P the names will go to the terminal).

```
BACKUP: BACKUP DRIVE 1 TO 0          2-5-81 (C) SANSASKA SYSTEMS

                    * COPYRIGHT      1981
                    * SANSASKA       SYSTEMS
                    * 3311  CONCORD  BLVD
                    * CONCORD,  CA   94519
                    * ALL RIGHTS RESERVED

                    * THE PROGRAM IS CALLED WITHOUT ARGUMENTS AND ALLWAYS
                    * COPIES FROM DRIVE 1 TO DRIVE 0. COPIES ARE MADE ONLY IF:
                    * 1. THE FILE IS NOT .CMD. .BIN. .SYS. OR .BAK.
                    * 2. THE FILE ON DRIVE 1 IS NEWER THAN THE COPY ON 0.
                    * 3. THERE IS NO COPY ON DRIVE 0.
                    * FILE NAMES ARE PRINTED. OPTIONALY TO THE PRINTER.

C100                ORG $C100               FLEX UTILITY SPACE
C100                *BAKUP
C100 20  39         BRA BAKUP1
C102 01             FCB 1                   VERSION NUMBER
                    * DATA AREA
             0000   *RDFCB   EQU   0         READ FCB
             0153   *WRTFCB  EQU   341
             0282   *BUFFER  EQU   490
C103                *DUPFLG  RMB   1         0/1/-1: NO COPY/DEL & COPY/COPY
C104                *MODAY   RMB   2         DATE STORAGE
C106                *YR      RMB   1
C107                *NDATA   RMB   2         LOC OF END OF DATA IN BUFFER
C109 49 4E 53 45    *STMSG   FCC   'INSERT DISK, HIT SPACE TO BACKUP, '
C128 52 45 54 55                   FCC 'RETURN TO EXIT.',4

C13B                *BAKUP1
C13B 10CE C6FF      LDS #$C6FF              TOP OF UTILITY AREA
C13F FC   CC0E      LDD MONTH               SYSTEM DATE
C142 FD   C104      STD MODAY
C145 B6   CC10      LDA YEAR
C148 B7   C106      STA YR                  SAVED
C14B                DO                      FOR ALL DISKS
C14B 86   01        .LDA #1
C14D B7   CC22      .STA OUTSW              PRINT TO CONSOLE
C150                .DO                     GET INSTRUCTIONS
C150 8E   C109      ..LDX #STMSG            START MESSAGE
C153 BD   CD1E      ..JSR PSTRNG            PRINT TO C MODLE
C156 BD   CD15      ..JSR GETCHR            GET ANSWER
C159                ..BREAKIF A=$20=$20     IF SPACE
C15D                ..BREAKIF A=$0D=$0D     IF  ETURN
C161                .ENDO                   TRY AGAIN IF NEITHER
C163                .BREAKIF A=$0D=L        IF   L DONE
                    *
                    *OPEN THE DISK DIRECTORY AND GO TILL DONE
C169 8E   CB40      .LDX #SYSFCB            DIRECTORY TO SYSFCB
C16C B6   01        .LDA #1
C16E A7   03        .STA 3,X                SET DRIVE 1
C170 86   D4        .LDA #OPENDR
C172  A7  84  .STA X
C174  BD  D406  .JSR FMS    OPEN THE DIRECTORY
C177 17   0206      .LBSR ERRXIT            EXIT IF ERROR
C17A B6   07        .LDA #CETIFR
C17C A7   84        .STA X                  SET FOR READ DIRECTORY
C17E                .DO                     UNTIL DIRECTORY FINISHED
C17E 8E   CB40      ..LDX #SYSFCB
C181 BD   D406      ..JSR FMS               GET NEXT ENTRY ID FCB
C184                ..IF NE                 IF ERROR
C186 E6   01        ...LDB 1,X              GET CODE
C188                ...BREAKIF B=$0B=L      IF ALL DONE
C18E 17   01EF      ...LBSR ERRXIT          ANY OTHER ERROR
C191                ..ENDF
C191 A6   08        ..LDA 8,X               FIRST CHAR OF NAME
C193                ..BREAKIF EQ=L          IF UNUSED THEN ALL DONE
C197                ..REPETIF MI            IF NAME DELETED TRY NEXT
C199 80   50        ..BSR TYPCHK            SEE IF TYPE TO COPY
C19B                ..REPETIF EQ            .BIN, .BAK, .SYS OR .CMD. NO COPY
C19D 7F   C103      ..CLR DUPFLG            INIT FOR NO COPY
C1A0 BD   76        ..BSR OPN4RD            OPEN FILE FOR READ ON DR 0
C1A2                ..IF B=$00              IF OPENED SUCCESSFULLY
C1A6 17   0090      ...LBSR ACC             SEE IF BACKUP IS OLDER THAN ON 1
C1A9                ...IF CS
C1AB 86   FF        ....LDA #-1             BACKUP IS OLDER
C1AD B7   C103      ....STA DUPFLG          SET FOR DELETE & COPY
C1B0                ...ENDF
C1B0 17   00A3      ...LBSR CLOSRD          CLOSE THE FILE
C1B3                ..ELSEF
C1B5 17   00FF      ...LBSR COPYQ           SEE IF WANT TO COPY
C1B8 B7   C103      ...STA DUPFLG           SET COPY ONLY
C1BB                ..ENDF
C1BB 70   C103      ..TST DUPFLG
C1BE                ..IF MI                 IF DELETE & COPY
C1E0 17   0PA1      ...LBSR DLTRDF          DELETE IT
C1C3                ..ENDF
C1C3 70   C103      ..TST DUPFLG
C1C6                ..IF NE                 IF COPY
C1C8 17   00A7      ...LBSR OPWSRC          OPEN FILE TO BACKUP
C1CB 17   01A7      ...LBSR SDLDATE         DIDDLE THE DATES
C1CE 17   012A      ...LBSR OPWDST          OPEN BACKUP FILE
C1D1 17   0142      ...LBSR COPFIL          COPY THE FILE
C1D4 17   0105      ...LBSR CLSFLS          CLOSE THEM BOTH
C1D7                ..ENDF
C1D7                .ENDO
C1D9                ENDO L

C1DC                *EXIT
C1DC FC   C104      LDD MODAY               RESTORE SYSTEM DATE
C1DF FD   CC0E      STD MONTH
C1E2 B6   C106      LDA YR
C1E5 B7   CC10      STA YEAR
C1E8 7E   CD03      JMP WARMS
```

```
                        ********************************************************
C1E0                    *TYPCHK
                        * RETURN EQ IF .BIN, .BAK, .SYS OR .CMD.
                        * ENTER WITH X=FCB TO CHECK
                        ********************************************************

C1E0 30  0C             LEAX 12,X               TEX=EXTENSION
C1E2 CE  C209           LDU #NOCOPY             U= NO COPY FILE TYPES
C1E5                    DO                      LOOK FOR NO COPY FILE TYPE
C1E5 34  30             .PSHS X,U               SAVE FOR NEXT PASS
C1E7 C6  03             .LDB #3                 3 CHARS TO TEST
C1E9                    .COUNT                  TEST EM
C1E9 A6  C0             ..LDA U+
C1EB                    ..BREAKIF M[            END MARK
C1EB                    ..BREAKIF A=M[,X+       IF CHAR'S NOT MATCH
C1EF                    .ENDC B                 MATCH, TRY NEXT CHAR
C1EF 35  50             .PULS U,X               RESTORE
 2B1                    .BREAKIF EQ             B=0, MATCH
C203 4C                 .INCA                   F0 WILL REMAIN =+ CHARS +
C204                    .BREAKIF M[             NO MATCH END MARK
C206 33  43             .LEAU 3,U               NEXT TEST SET
C208                    ENDDO
C208 39                 RTS

C209 42 41 4B 42    *NOCOPY  FCC    "BAKBINCMDSYS".=F0

                        ********************************************************
C21B                    *OPN4RD
                        * OPEN THE FILE CURRENTLY NAMED IN THE DIRECTORY FOR
                        * DRIVE 0. RETURN B=4 IF NOT THERE ELSE RETURN B=0.
                        ********************************************************

C21B 8E  0000           LDX #RDFCB+4
C21E CE  CB44           LDU #SYSFCB+4
C221 17  014B           LBSR COPYNM             COPY NAME TO FCB
C224 8E  0000           LDX #RDFCB
C227 6F  03             CLR 3,X                 DRIVE 0
C229 86  01             LDA #OPENRD
C22B A7  84             STA X
C22D BD  D406           JSR FMS                 OPEN FOR READ
C230 E6  01             LDB 1,X                 ERROR CODE
C232                    IF NE                   IF ERROR
C232                    .IF B,NE,#4             IF ANY ERROR BUT NOT THERE
C232 17  014B           ..LBSR ERRXIT           GO WITH TRAIL
C235                    .ENDF
C235                    ENDF
C235 39                 RTS

                        ********************************************************
C236                    *AGE
                        * COMPARE CREATION DATES OF FILE ON DRIVE 1 WITH SAME
                        * NAME FILE ON DRIVE 0. RETURN CS IF ONE ON 0 OLDER.
                        ********************************************************

C236 8E  CB40           LDX #SYSFCB
C239 CE  0000           LDU #RDFCB
C23C A6  CB 1B          LDA 27,U                BACKUP YEAR
C23F                    IF A<#B,*27,2*          IF NOT OLDER
 247 A6  CB 19          .LDA 25,U               BACKUP MONTH
C24A                    .IF A<#B,*25,1*         IF NOT OLDER
C24C A6  CB 1A          ..LDA 26,U
C24F A1  8B 1A          ..CMPA 26,X             SET FLAGS ON DAY
C252                    .ENDF
C252                    ENDF
C252 39                 RTS


                        ********************************************************
C253                    *CLOSRD
                        * CLOSE THE FILE CURRENTLY IN THE RDFCB
                        ********************************************************

C253 8E  0000           LDX #RDFCB
C256 86  04             LDA #CLOSEF
C258 A7  84             STA X                   SET CLOSE
C25A BD  D406           JSR FMS                 CLOSE IT
C25D 17  011D           LBSR ERRXIT
C260 39                 RTS


                        ********************************************************
C261                    *DLTRDF
                        * DELETE THE FILE CURRENTLY SPECIFIED IN RDFCB.
                        ********************************************************

C261 8E  0000           LDX #RDFCB
C264 86  0C             LDA #DLFILE
C266 A7  84             STA X
C268 BD  D406           JSR FMS                 DELETE THE FILE
C26B 17  010F           LBSR ERRXIT
C26E 39                 RTS

                        ********************************************************
C26F                    *OPNSRC
                        * OPEN THE FILE NAMED IN THE SYSFCB ON DRIVE 1. PRINT
                        * THE FILE NAME.
                        ********************************************************

C26F 8E  0044           LDX #RDFCB+4
C272 CE  CB44           LDU #SYSFCB+4
C275 17  0111           LBSR COPYNM             COPY NAME TO RDFCB
C278 8E  0000           LDX #RDFCB
C27B 86  01             LDA #1
C27D A7  03             STA 3,X                 SET DRIVE 1
C27F A7  84             STA X                   SET OPEN FOR READ
C281 BD  D406           JSR FMS                 OPEN IT
C284 17  00F6           LBSR ERRXIT             IF ERROR
C287 86  FF             LDA #-1
C289 A7  8E 3B          STA 59,X                SET NO COMPRESSION
C28C 8E  0044           LDX #RDFCB+4            POINT AT NAME
C28F 7F  CC22           CLR OUTDV               SEND TO PRINTER IF =P= USED
C292 BD  01             BSR PRNAME              PRINT FILE NAME
C294 39                 RTS

                        ********************************************************
C295                    *PRNAME
                        * PRINT FILE NAME +X
                        ********************************************************

C295 E6  88             LDB 0,X                 SAVE EXTENSION
C297 86  04             LDA #EOD
C299 A7  88             STA 8,X                 SET FOR PSTRNG
C29B BD  CD1E           JSR PSTRNG
C29E E7  84             STB X
C2A0 86  2E             LDA #'.
C2A2 BD  CD18           JSR PUTCHR              PRINT '.'
C2A5 8D  0B             BSR COPUT               PRINT EXTENSION
C2A7 8D  06             BSR COPUT
C2A9 8D  04             BSR COPUT
C2AB 7C  CC22           INC OUTDV               NO MORE TO PRINTER
C2AE 39                 RTS

C2AF                    *COPUT
C2AF A6  80             LDA ,X+                 GET EXTENSION CHAR
C2B1 7E  CD10           JMP PUTCHR              PRINT IT

                        ********************************************************
C2B4                    *COPYQ
                        * FILE DOES NOT EXIST ON BACKUP DISK. SEE IF IT IS TO
                        * BE  COPIED AS A NEW BACKUP.
                        * RETURN A=0 FOR NO COPY, A=1 FOR COPY.
                        ********************************************************

C2B4                    DO
C2B4 8E  CB44           .LDX #SYSFCB+4          FILE NAME
C2B7 8D  8C             .BSR PRNAME             PRINT IT
C2B9 8E  C2D7           .LDX #PROMEST           PRINT QUESTION
C2BC BD  CD1E           .JSR PSTRNG             PRINT QUESTION
C2BF BD  CD15           .JSR GETCHR             GET ANSWER
C2C2                    .IF A=#Q,+#Y*           IF YES.
C2C9 86  01             ..LDA #1                SET COPY
C2CB                    ..BREAK
C2CB                    .ENDF
C2CB                    .IF A=#Q,+#N*           IF NO
C2CD 4F                 ..CLRA                  SET NO COPY
C2CE                    ..BREAK
C2CE                    .ENDF
C2CE                    ENDDO                   TRY AGAIN
C2D0 39                 RTS

C2D1 20 49 53 20    *PROMEST FCC    * IS NOT ON BACK-UP. COPY IT? (Y=N)*,4

                        ********************************************************
C2F8                    *OPNWRT
                        * OPEN THE BACKUP FILE ON DRIVE 0. USE WRTFCB
                        ********************************************************

C2F8 8E  0159           LDX #WRTFCB+4
C2FB CE  CB44           LDU #SYSFCB+4
C2FE 17  0088           LBSR COPYNM             NAME TO WRTFCB
C301 8E  0155           LDX #WRTFCB
C304 6F  03             CLR 3,X                 DRIVE 0
C306 86  02             LDA #OPENWR
C308 A7  84             STA X
C30A BD  D406           JSR FMS                 OPEN FOR WRITE
C30D 86  FF             LDA #-1
C30F A7  8E 3B          STA 59,X                NO COMPRESSION
C312 39                 RTS

                        ********************************************************
C313                    *COPFIL
                        * COPY THE FILE #RDFCB TO FILE #WRTFCB. USE LARGE BUFFER.
                        ********************************************************

C313                    DO                      UNTILL FILE COMPLETELY COPIED
C313 8E  0000           .LDX #RDFCB
C316 CE  0282           .LDU #BUFFER
C319                    .DO                     READ TILL FULL OR END
C319 BD  0406           ..JSR FMS               READ BYTE
C31C                    ..IF NE                 IF ERROR
C31C E6  01             ...LDB 1,X
C31E                    ...BREAKIF B=#0.0B      IF EOF
>C320 17  0036          ...LBSR ERRXIT          ANY OTHER ERROR
C323                    ..ENDF
C323 A7  C0             ..STA U+                PUT IN BUFFER
C325                    ..BREAKIF U=#ED:MEMEND  IF MEMORY FULL
C325                    .ENDDO                  NEXT IF NOT FULL
C325                    .DO                     BACK UP TO FIRST NON 0
C325 6D  C2             ..TST -U
C327                    ..BREAKIF NE            WHEN U= TO IT
C327                    .ENDDO
C327 F7  C107           .STU #DATA              MARK END OF DATA
C32A 8E  0155           .LDX #WRTFCB
C32D 10  0282           .LDY #BUFFER
C331                    .DO                     WRITE FILE TO BACKUP DISK
C331 A6  C0             ..LDA U+                GET BYTE
C333 BD  0406           ..JSR FMS               WRITE BYTE
>C336 17  0035          ..LBSR ERRXIT           ANY ERROR
C339                    ..BREAKIF U=#1,#DATA    IF ALL DATA SENT
C339                    .ENDDO                  SEND NEXT IF ALL NOT DONE
C339 D6  01             .LDB RDFCB+1            STATUS OF READ FILE
C33B                    .BREAKIF B=#0.0B        IF ALL READ IN
C33B                    ENDDO
C33B 39                 RTS


                        ********************************************************
C33C                    *CLSFLS
                        * CLOSE BOTH FILES
                        ********************************************************

C33C C6  04             LDB #CLOSEF
C33E 8E  0000           LDX #RDFCB
C341 E7  84             STB X
C343 BD  D406           JSR FMS                 CLOSE READ FILE
>C346 17  0017          LBSR ERRXIT
C349 8E  0155           LDX #WRTFCB
C34C E7  84             STB X
C34E BD  D406           JSR FMS                 CLOSE WRITE FILE
>C351 17  000C          LBSR ERRXIT
C354 39                 RTS

                        ********************************************************
C355                    *DDLDATE
                        * PUT SOURCE DATE IN SYSTEM DATE SO FOR BACKUP FILE.
                        ********************************************************

C355 DC  19             LDD #RDFCB+25
C357 F0  CC0E           STD MONTH               FILE DATE TO SYSTEM
C35A 9A  1B             LDA #RDFCB+27
C35C 8D  CE10           STD YEAR
C35F 39                 RTS

                        ********************************************************
C360                    *ERRXIT
                        * FMS ERROR. REPORT IT, FIX DATE & RETURN TO FLEX
                        * CALLING WITH A LBSR LEAVE TRAIL FOR DEBUG ING.
                        ********************************************************

C360                    IF EQ                   IF NO ERROR RETURN
C362 39                 .RTS
C363                    ENDF
C363 BD  CD3F           JSR RPTERR              REPORT ERROR
C366 BD  0403           JSR CLOSEA              CLOSE EVERYTHING
C369 16  FE50           LBRA EXIT               LEAVE THIS MESS


                        ********************************************************
C36C                    *COPYNM
                        * COPY FILE NAME +U TO +X.
                        ********************************************************
```

```
C38C C6  09      LDB #11      NAME + EXTENSION
C38E             COUNT
C38E A6  C0      .LDA U+
C390 A7  B0      .STA X+      COUNT BYTES MOVED
C392             ENDC B
C395 39          RTS
                 END BAKUP

0 ERROR(S) DETECTED
```

MICRODYNE

MICRODYNE PRODUCTS

The 68 Micro Journal lab has received three MICRODYNE products for review. They are the BT-1 Active Bus Terminator, the Uniface BR-1 Bit Rate Generator and the MPA and MPA2 CPU Upgrade Clock Xtal kit.

CPU UPGRADE CLOCK KIT

The CPU Upgrade Clock Xtal kit is designed to replace the resistor and capacitor timing circuit of the MPA2 CPU board (SWTPC). By the utilization of Xtal timing (much more precise) as opposed to R/C timing (subject to thermal constant changes and clock timing shifts). For general purpose applications the R/C timing is normally sufficient, but for critical applications, where the clock frequency must run a known rate with stability, the Xtal circuit is the preferred choice.

The kit includes the necessary Xtal (2.000 MHZ) and the necessary capacitors and resistors to effect the modification.

The price is about $10.00 from MICRODYNE.

THE BR-1 BIT-RATE GENERATOR

For those who have changed over to the S50C motherboard configuration this kit allows the generation of necessary baud rate signals while residing on the 30 pin bus. We have found that this is ideal for those who have upgraded to the 6809 and S50C bus (which eliminated the 50 pin bus baud rate lines). Included are complete instructions for upgrading the older Standard S50 Bus to the new Standard S50C Bus. Also included are instructions for upgrading the MPA and MPA2 CPU boards to more recent standards and Xtal clock operation.

The price is $65.00 tested and assembled and $44.00 with partial parts included.

THE BT-1 ACTIVE BUS TERMINATOR

The BT-1 Active Bus Terminator is a Standard S50 Bus board that works wonders on some computers. Some systems seem to generate little noise on the bus, while others running the same boards generate more, to one degree or another. Unexpected 'crashes' and 'hang-ups' are often caused by bus noise, in some systems. A close examination of the address and data lines, while the CPU or other device is accessing them, sometimes shows varied levels of noise and other unwanted non-signals. Active bus termination is the answer. The BT-1 Terminator works fine on one particular system we have here. Microdyne quotes 5 MHZ operation on all standard motherboards. We do not have a 5 MHZ system (we do have a 2.7 MHZ system) and therefore can report that it works fine on that system. Fact is ours (BT-1) now resides on this system. The design is quite similar to the DEC unibus standard. This unit should be a must on those systems running serious applications.

The price tested and assembled is $75.00 from Microdyne.

All of the above kits can be ordered with gold plated connectors at an additional cost. For more information contact:

MICROOYNE POB 1707 Greenville, Miss 38701 (601) 335-9321

68 Micro Journal Lab - - -

GRAPHICS

A Comment
by
Tom Harmon
of
H H H Enterprises

A great deal of my personal software includes some kind of graphic output. There seems to be a magical relationship of person to machine when all your calculations can be reduced to a set of lines or figures on a graphic device. I have played with a number of machines that produce some kind of image, and I found a lot of problems when I tried to bring some of my masterpieces from one machine to another. Generally very ugly variations in Basic, and certainly in the display devices. Strong language became a habit every time I had to go through this process.

Presto! I thought, it would be great if all devices answered the same commands and were independent of the driving language! Bingo! A standard syntax for graphics was born. The exact functions of the syntax were discussed (sometimes loudly) with various peoples, and the result is our standard syntax.

Some basic rules are: 1- a standard of mechanical measurement that is invarient with the display. That way a flower on my screen would not turn into a dot, or a billboard on yours. 2- use of ASCII characters for control to eliminate the variations of Languages, since all Languages generate ASCII characters to communicate to the outside world. 3- it must be able to support a large number of devices.

Our standard of physical measurment is 0.1 millimeters. A movement of 254 points is exactly equal to one (1) inch (on any device)! It was selected based on the ability of hardcopy devices to resolve this step at a lower limit, while it allows (in 16 bit arithmatic) to achieve a 3 meter by 3 meter plot if your device can stand it. (A survey of graphics for small systems showed that 97.3% of all graphics were done in a space of 8 by 8 inches. This puts a burden on the syntax translator software that has to convert the data

received into what is required to operate a device with less resolution. The first try was with an ISC color terminal and a Hi-Plot (TM) plotter. It was very easy to use since the same programme (in Basic) generated the same data for both devices.

The syntax consists of a single ASCII character as a command, followed by a strino of spaces and ASCII digits to transmit values. We have defined the ENTIRE ASCII character set, but will only discuss those characters currently supported (sometimes limited by display device). Commands are generated with a Basic Print statement and sent to the translator as if it were a printer. The delimiter characters are ALL the control characters and spaces, with no limit on the count of delimiters between numbers, this removes the burden of finding out what your language sends for padding etc.

The specific syntax is defined as:

'A X Y Z

AXIS - Draw an axis with tic marks X=1 for horizontal, X=0 for vertical Y= length of segment between tics (1.1mm.) Z= number of segments

'B N

BROKEN line - a number from 1 to 127 that controls the size of dashes and spaces in a plotted line (L must =1)

'C N

COLOR - N=0 black (crt), erase(hardcopy), N=1 white (crt), pendown (hardcopy), N=2 is RED, N=3 is GREEN, N=4 is YELLOW, N=5 is MAGENTA, N=6 is CYAN, Multiple uses of digits within a number will allow mixing shades of colors. Number length is limited to 20 digits.

'D X1 Y1 ..... XN YN

DRAW - draw a line from current position to X1,Y1. This will support a list of numbers.

'H

HOME - Does a non-destructive move to 0,0 and does not change any internal flags. (0,0 is ALWAYS the lower left corner).

'I N

INDEX - Puts a mark on the current position. N=1 is a Dot, N=2 is a diamond, N=3 is a square, N=4 is a triangle, N=5 is an hourglass, N=6 is an octagon.

'L N

LINE - N=0 is solid lines, N=1 is broken line (set by B).

'N X1 Y1 ..... XN YN

MOVE RELATIVE - Move the position pointers without marking. Will support a list.

'P X1 Y1

POSITION - Move to an absolute position, non-destructive.

'R

RESET - Does a home pen on hardcopy, clears the screen of a CRT, sets all flags to startup values.

'S N

SCALE - set size of printable text or marks. N=0 thru 15 for size of marks or letters.

'T N

TILT - the angle to print text or marks. N=0 is normal left to right printing, N=1 rotate 90 degrees, N=2 rotate 180 degrees, N=3 rotate 270 degrees. (there is much arguement to change this to N=degrees, but very few devices will allow that.)

'V X1 Y1 ..... XN YN

VECTOR - draw a vector relative to current position. Will support a list.

'W"various text"

WRITE - a 'W' followed by printable text for labeling plots, a C/R terminates the command. IE. PRINT "WTEST STUFF" (in Basic) generates TEST STUFF .

At this time I must say that although we developed this syntax some time ago, I was so impressed by the Watanabe 'Digi-Plot' (TM) plotter that we changed the values used in 'T' and 'I' to match the values that they use. This was done for unified software conversions only. The syntax that they use puts a high burden on the application writer to keep track of the proper delimiters, and forces some really ugly statements in Basic. However, it is such a wonderful device that our finished drivers are very small due to the inbuilt smarts in that plotter.

CRT's bring some special problems. There is some tough math conversions done in the translator software so that an 'average' TV set (3x4 aspect ratio), will display a round circle when called for. At the present, our CRT versions all assume a 13 inch color or 15 inch B&W monitor. This allows the 80 MM circle to be approx. an 80 MM circle on the average device. THE TRANSLATOR SOFTWARE MUST CARRY THE BURDEN OF CONVERTING MEASUREMENTS TO THOSE THAT CAN BE DISPLAYED CORRECTLY REGARDLESS OF THE RESOLUTION OF THE PLOTTING DEVICE.

The very important advantage of this type of approach is that ALL my programmes will run the same way on any other display. To show this let me print a small demo programme (in Basic09[tm]).

```
(* CLEANS THE SCREEN *)
(* YOU CAN JUST AS EASILY OPEN *)
(* A DISK FILE OR PRINTER      *)
INPUT "WHAT RADIUS DISPLAY ",RADIUS
(* RADIUS IS IN MM. *)
RADIUS=RADIUS*10
(* MAKE INTO .1 MM STEPS *)
FOR I=0 TO 360 STEP 5
XI=INT(SIN(I)*RADIUS+RADIUS)
YI=INT(COS(I)*RADIUS+RADIUS)
PRINT@PLOT,"P",RADIUS,RADIUS,"D",XI,YI
(* NOTE THAT I DONT CARE IF THERE IS*)
(* ONE SPACE OR 10 BETWEEN NUMBERS  *)
NEXT I
PRINT@PLOT,"H"
(* BRING BACK TO HOME POSITION *)
CLOSE@PLOTEND
```

The whole thing is done by 'P' for position and 'D' for draw. This generates the same (size too) image on both my Hazelwood VC-256 and on my Watanabe MIPLOT. No rewriting! Using this syntax means that other people can run applications on their systems and send me the data, (by phone or diskette) and have it plotted on my hardcopy machine. It also means that development can be done on a video display MUCH faster than on the hard copy.

GAMES interface will use the lower case ASCII character set for special shape tables and manipulation of data. (We are currently discussing the addition of 3D conversions). We would like to hear suggestions as to what the most used functions would be.

Use of a standard syntax for graphics will bring many people into the SS-50 world since interchange will not depend on the device in use. The more people that write for SS-50, the more choices we have.

MORE SPEED?

I too have run the Basic programme that generates primes as a test case. (see fig. 1). TSC times are from his article in April 81 Micro Journal. Here is the result:

TSC UniFLEX BASIC	1h 10min 10s.
TSC UniFLEX PASCAL	34min 35s.
OS9 BASIC09	23min 45s.

Does that mean that BASIC09 is faster in everything that it does? To test that I loaded Dave's PASCAL algorithm (Niklaus Wirth) into my BASIC09 and ran it. (see fig. 2). OH ME, it was slower!

TSC UniFLEX PASCAL	5.6s.
OS9 BASIC09	47 s.

Is BASIC09 slower than TSC PASCAL? NOT in the first test!!! All this shows is that test programmes can be written to take advantage of certain known speed advantages. In any test, a native code compiler output will probably be faster then an interactive language. But it was not faster on the original test. No mention of CPU speed was made for either test, no mention of process stack loading and background servicing. I had nine (9) background tasks running befor I could make the original test stretch out to I hour.

Another thing to consider is the compile procedure and time taken. BASIC09 is BOTH a compiler and interactive for live tracing. The actual compile time is less then 0.3 sec. for this size programme (actually I have not figured out how to measure this yet as it it too fast to see any delay on the terminal even at 9600 baud, so I feel safe in saying <0.3 sec.). Those of us that have used Software Dynamics Basic Compiler (6800) know what a pain it is to go back to source and correct a mistake and then go thru the compilation proceedure again, only to have to do it again on the next error found.

Let us propose a test of true system thruput, using common equipment. Let us find a programme that will exercise a system using average business or scientific programmes since it has been a long time since I needed the first 1229 prime numbers. It should probably be in Basic, but I will not turn down PASCAL out of hand since BASIC09 will run it with minor modifications. (I think that using ':=' is a waste of typing time !. I also have never seen any business programming in PASCAL! The test should include I/O to a printer (300 baud), to test I/O handling (ie. does the system turn the cpu back to do crunching instead of waiting for I/O?). It should use floppy disk (very few people have hard disk), and a terminal (not mapped video). I could be unfair and ask that the entire thing run in 50K of ram but even though most of us have less than 56K I will allow 96K of ram for UniFLEX. (IS THAT REALLY THE MINIMUM??).

In terms of size, BASIC09 and OS9 should run against normal FLEX and its' Basic, but that would be a severe case of mismatch as FLEX has none of the multitasking and multiuser goodies or resource managment of OS9 or UniFLEX.

An interesting example of ambiguous test results is the Martin test of the same issue (see fig.3). Why is BASIC09 only slightly faster than plain TSC Basic? BASIC09 is 9 digit display, 10 digit internal accuracy. The Martin test looks more realistic for comparison, and I have not modified it to take advantage of those statements that might make it much faster in BASIC09.

```
TSC  BASIC      147 SEC.
TSC EXT BASIC   272 SEC.
OS9 BASIC09     139 SEC.
```

Now that I have spoken out for fair tests I must tell you what I used for a system for my tests. SIMIX CPU card at 2mhz., SMOKE SIGNAL BROADCASTING DCB-4 disk controller, 56K ram, a CT-64 terminal, an ISC terminal, a TeleVideo terminal, 8 inch DS/DD and 2ea. 5inch SS/DD drives. (also a CDS-1, not installed yet.). THE SOFTWARE THAT I RAN CAN BE INSTALLED ON MOST EXISTING 6809 SYSTEMS WITHOUT USING LARGE RAM AND DOES NOT LOSE ANY CAPABILITIES. You are only limited by the size of programmes as to how many users or tasks you can put on your system. On this system a normal load is two users doing name and address loading (for another customer) and one doing development. (56K!).

I will not engage in a battle of wordsmithing with anyone, but I will run and print any fair test that includes full specifications, limitations on rewriting, and other controls.

```
PROCEDURE bprimes
 0000       REM RUNS IN 23 MIN. 45 SEC.
 001A       REM 2mhz. cpu
 0026       REM BASIC09 (TM)
 0035       REM compile time <0.3 sec.
 004E       DIM C,M,K:INTEGER
 005D       PRINT "LIST OF PRIME NUMBERS"
 0076       PRINT 1,2,3
 0080       A$=DATE$
 0086       C=0
 008D       M=3
 0094 60    M=M+2
 00A2       FOR K=3 TO M/2 STEP K-1
 00BF         IF M/K*K-M=0 THEN 120
 00DA       NEXT K
 00E5       C=C+1
 00F0 120   IF M<10000 THEN 60
 0103       PRINT "C="; C
 010D       B$=DATE$
 0113       PRINT "START="; A$
 0121       PRINT "END  ="; B$
 012F       END

PROCEDURE PPRIMES
 0000       (* this is BASIC09 (TM)   *)
 001C       (* find the first 1229 primes *)
 003C       (* runs in 47 sec. 2mhz. cpu *)
 005B       (* compile time <0.3sec. *)
 0076       DIM i,k,x,inc,lim,square,l:INTEGER
 0095       DIM prim:BOOLEAN; p(1229),v(1229):INTEGER
 00B0       DIM n,n1:INTEGER
 00BB       n:=1229
 00C3       n1:=35 \(* sqrt of 1229 *)
 00DC       (* begin *)
 00E7       a$=DATE$
 00ED       l=2
 00F4       x:=1 \inc:=4 \lim:=1 \square:=9
 0110       FOR i:=3 TO n
 0121         (* find next prime *)
 0136         REPEAT
 0138           x:=x+inc \inc:=6-inc
 014F           IF square<=x THEN
 015C             lim:=lim+1
 0167             v(lim):=square \square:=p(lim+1)*p(lim+1)
 018B           ENDIF
 018D           k:=2 \prim:=TRUE
 019A           WHILE prim AND k<lim DO
 01AB             k:=k+1
 01B6             IF v(k)<x THEN v(k):=v(k)+2*p(k)
 01DE             ENDIF
 01E0             prim:=x<>v(k)
 01EF           ENDWHILE
 01F3         UNTIL prim
 01FB         IF i<=n1 THEN p(i):=x
 0213         ENDIF
 0215         (* write x used to be here *)
 0232         l:=l+1
 023D         IF l=10 THEN
 0249           (* print used to be here *)
 0264           l:=0
 026B         ENDIF
 026D       NEXT i
 0278       b$=DATE$
 027E       PRINT "start ="; a$
 028D       PRINT "end   ="; b$
 029C       END
PROCEDURE martin
 0000       REM RUNS IN 139 SEC.
 0013       REM CPU AT 2MHZ.
 0022       REM THIS IS BASIC09 (TM)
 0039       DIM A(50,50),V(50),X(50):REAL
 005B       DIM I,J,K,L,M,N:INTEGER
 0076       INPUT "COUNT ?",N
 0085       A$=DATE$ \XN=N
 0094       FOR I=1 TO N \V(I)=I \NEXT I
 00BD       FOR I=1 TO N \ FOR J=1 TO N
 00DF           A(I,J)=0
 00EE         NEXT J \NEXT I
 0104       FOR I=1 TO N \ FOR J=1 TO N
 0126           A(I,J)=A(I,J)+1/(V(I)*V(J))
 014D         NEXT J \NEXT I
 0163       FOR I=1 TO N
 0174         A(I,I)=A(I,1)+1 \V(I)=V(I)+XN/V(I)
 01A7       NEXT I
 01B2       GOSUB 200
 01B6       GOSUB 400
 01BA       B$=DATE$
 01C0       PRINT "START="; A$
 01CE       PRINT "END  ="; B$
 01DC       FOR I=1 TO N \ PRINT X(I) \NEXT I
 0200       END
 0202 200   FOR I=1 TO N
 0216         FOR J=1 TO N
 0227           S=A(I,J) \K1=J-1
 0241           IF J=1 THEN 250
 0250           FOR K=1 TO K1
 0262             S=S-A(K,I)*A(K,J)
```

```
027E            NEXT K
0289 250        IF J=1 THEN 260
029C            GOTO 280
02A0 260        T=1/SQRT(S)
02B0            A(I,J)=T \ GOTO 290
02C3 280        A(I,J)=S$T
02D9 290      NEXT J \NEXT I \ RETURN
02F4 400    FOR I=1 TO N \S=V(I)
0313          K1=1-1
031F          IF I=1 THEN 430
032E          FOR K=1 TO K1
0340            S=S-A(K,I)$X(K)
0359          NEXT K
0364 430      X(I)=S$A(I,I)
037D        NEXT I
0388        FOR M=1 TO N
0399          I=N-M+1 \S=X(I) \K2=I+1
03BF          IF I=N THEN 490
03CF          FOR K=K2 TO N
03E2            S=S-A(I,K)$X(K)
03FB          NEXT K
0406 490      X(I)=S$A(I,I)
041F        NEXT M
042A        RETURN
```

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* * FILESORT * *

A Contest Grand Prize Winner

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"FILESORT" is a comprehensive file cataloging utility program which runs under the "FLEX" disk operating system by Technical Systems Consultants, Inc. It is written in position-independent code for the Motorola M6809 microprocessor. There are ten commands, most of which may be parameterized with one or more sets of parameter limits. This enables particular files or groups of files to be operated on from a larger group. For example, you may choose to print out all files on disk named "EXAMPLE", volume numbers 20 through 30, whose file names begin with "A??A" through "TEST??s", which were created between 10/31/79 and 4/4/80. The fast SHELL-METZNER sort subroutine may be keyed on any or all of the file and disk parameters, in any order.

In this version, the following commands are implemented: ("[xxx]" indicates optional entries)

B: Read catalog file from disk: the default drive is the working drive, and the default extension is ".CAT"; the file is read and all entries which match the parameter limits are added to the buffer.

Syntax: B,<file spec> [,<optional parameter limit(s)>]

W: Write catalog file to disk: the default drive is the working drive, and the default extension is ".CAT"; all entries which match the parameter limits are written to the disk.

Syntax: W,<file spec> [,<optional parameter limit(s)>]

C: Catalog disk: the disk catalog is read and all of the disk and file attributes which match the parameter limits are added to the catalog buffer.

Syntax: C,<drive number> [,<optional parameter limit(s)>]

D: Delete catalog entries: all entries which match the parameter limits are deleted; an "are you sure" prompt is issued in order to prevent accidental erasure through mistyped commands.

Syntax: D [,<optional parameter limit(s)>]

P: Output catalog buffer to printer: all entries which match the parameter limits are printed.

Syntax: P [,<optional parameter limit(s)>]

NOTE: The "P" command assumes that the system print routine is resident. If not, you may call it with the "I" command (i.e. enter "I.P" before using the FILESORT "P" command).

T: Output catalog buffer to terminal: all entries which match the parameter limits appear on the terminal.

Syntax: T [,<optional parameter limit(s)>]

I: Execute FLEX command line: the command line following "I" is passed to FLEX for processing.

Syntax: I. <FLEX command line>

NOTE: All FLEX commands run using "I" MUST NOT modify FILESORT or its buffer space.

N: New catalog: the buffer will be cleared and FILESORT will be restarted. An "are you sure" prompt is issued.

Syntax: N

E: End FILESORT: return to FLEX. An "are you sure" prompt is issued.

Syntax: E

S: Sort catalog buffer command. The sort command uses a fast multiple key version of the SHELL-METZNER algorithm. The user may enter any or all of the parameter keys in any order, and the catalog buffer will be sorted according to these keys. If no keys are entered, the default order will be used (FN,FE, FS,FT,DN,DE,DV,DD). For example, if "S.FE,FT,DE,DV,FS" is entered, the sort will be keyed first by file extension, then by file date, then by disk extension, then by disk volume number, and finally by file size. All unspecified parameters will be keyed in default order, unless "-E" is entered at the end of the parameter list, in which case the unspecified parameters will not be considered.

The parameters are:

```
FN = File Name
FE = File Extension
FS = File Size
FD = File Date
DN = Disk Name
DE = Disk Extension
DV = Disk Volume Number
DD = Disk Date
```

PARAMETER LIMIT INPUT:

The B,W,C,D,P, and T commands may all be parameterized. In each case, you may specify lower and upper limits for each parameter, and only entries within those limits will be affected by the command. Parameters are entered as follows:

<parameter abbreviation>=<parameter specification>[,delimiter]

The parameter specification is in one of three formats, depending upon the type of data:

1) FN,FE,DN, or DE : Alphanumeric name with optional "wild card" character(s)

2) FS or DV : Decimal number

3) FD or DD : Month/Day/Year

The "wild card" character is a "?", and will match any character in the same position within the name or extension. For each parameter specification, you may enter either a single value, or a pair of values separated by a colon.

Examples:

```
FN=FILESORT
FS=10
FS=1:24
FE=BIN:CMD
DS=10/21/79
FD=10/1/79:1/24/80
FN=A??AA:?A???ONE
DA=??????LEX:77777EST
```

Extensions are entered without a period preceeding them. If an alphanumeric date item is entered which is longer than necessary (e.g., a four letter extension), then the excess is ignored. If one is entered which is shorter, then the remaining characters will be assumed to be "wild card" characters.

The delimiter may be a comma, a semicolon, or a carriage return. Commas are used in order to separate multiple parameter limits within one group; for example:

```
F,FN=CAT,FE=BIN:CMD,FD=10/1/79:10/21/79
```

would delete only entries whose file name began with "CAT", which had an extension between "BIN" and "CMD" inclusive, and which were created during October, 1979.

Semicolons are used in order to separate different sets of parameter limit(s). The command's action is repeated for each of the sets of parameter limits; for example:

```
D,TEST,FE=CMD,FS=1:10; FS=100:342,DV=1
```

would create a file on the working drive named "TEST.CAT", and would write in it all entries whose file extension was "CMD" and whose file size was one through ten. It would then start at the beginning of the catalog buffer again and write all entries whose file size was 100 through 342 which were located on any disk whose volume number was one.

A carriage return signifies end-of-line. If no parameters are entered for a command, all files will be considered as matches.

RUNNING FILESORT:

FILESORT is written in position-independent 6809 code. It may be run anywhere in user memory without any changes; however, the initialization routine compares FILESORT's midpoint with the midpoint of user memory as obtained from FLEX (by dividing the user memory limit value by two). If FILESORT is past the midpoint, the area below FILESORT will be used for the catalog buffer; otherwise the area above it will be used. If FILESORT is above the user memory limit, then the entire user memory space will be used. For this reason, FILESORT should be near either end of memory for maximum catalog capacity. If you have other programs in memory and wish to specify fixed areas for the buffer, simply put the starting buffer address in "BUFBEG" and "BUFFTR", and put the ending buffer address in "BUFEND". The addresses for these variables are:

```
BUFBEG = $0B13 + FILESORT lower boundary
BUFEND = $0B15 + FILESORT lower boundary
BUFPTR = $0B17 + FILESORT lower boundary
```

You must then start FILESORT at the warm start address, which is the cold start address (FILESORT lower boundary) plus three. In this case, do not use the "N" command, since it re-initializes the buffer. If you wish to clear the buffer, type "D CC/B".

This program is a much-enhanced version of my original 6800 file sorting utility. If you have any questions, I will be working in New York City from April 28 through early October, but if you contact my Florida address, the message will be related to me.

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P.S. I hope by next January to have my 6809E system running.

```
                        TTL   MEMBER FILE CATALOGING UTILITY
                        SPTL  FILESORT V6.3C  (4/6/80 --- BRIAN F. BAILEY  WB4MMF)
0000                    ORG   $0400  (Relocatable code)
                *
                *
                *  FILESORT V6.3C COPYRIGHT 1980 BY BRIAN F. BAILEY  WB4MMF
                *
                *
                *  "FILESORT" is a program for the cataloging of FLEX and FLEX9
                *  disk files.  It has commands for reading, writing, cataloging,
                *  deleting, sorting, and printing the file list according to
                *  one or more sets of user-entered parameter limits.  The program
                *  is written using position-independent code for the powerful
                *  MOTOROLA 6809E microprocessor.  FILESORT may be moved and
                *  run anywhere in memory without any changes!  However, since the
                *  initialization routine places the catalog buffer space either
                *  above or below FILESORT, whichever has more room, placing FILESORT
                *  near either end of memory will yield maximum catalog capacity.
                *  Each file entry requires 32 bytes, which includes File Name,
                *  File Extension, File Size, File Creation Date, Disk Name, Disk
                *  Extension, Disk Volume Number, and Disk Creation Date.
                *  The sorting subroutine is an extremely fast multiple key sort using
                *  the SHELL-METZNER algorithm.  The sort may be keyed on any of all
                *  of the file or disk parameters, in any order.  The cataloging
                *  commands may also be followed by a parameter list with the
                *  lower and upper limits of any or all parameters.
                *
                *
0018    DSK     LPERPG  RMB   $8        Catalog entry lines per page
                *
                *
                *  The following references are to the "FLEX" disk operating system,
                *  by Technical Systems Consultants (TSC).  All references to FLEX
                *  subroutines and variables are made using absolute addresses
                *  since FLEX resides at a fixed address.  All subroutines and
                *  variables within FILESORT are referenced using relative addresses
                *  since it is position-independent.
                *
CD03    STACK   EQU   $CD03     DOS Stack offset
CD18    FCBADR  EQU   $CD18     Disk name offset in system information record (SIR)
CC4F    FCB     EQU   $CC4F     File Control Block
CC10    BUFCTR  EQU   $CC10     Buffer return address
CC22    OUTFLG  EQU   $CC22     Output flag
CC23    NULCNT  EQU   $CC23     Post-CR/LF field
CC29    CHRCNT  EQU   $CC29     Byte counter/LF field
D400    FMS     EQU   $D400     Enter FLEX
D403    PUCHAR  EQU   $D403     Write one byte
D406    RDCHAR  EQU   $D406     Input character
D409    RPTERR  EQU   $D409     Report error
CD0C    OUTDEC  EQU   $CD0C     Output decimal number
CD0F    GETFIL  EQU   $CD0F     Parse file specification
CD12    INCHR   EQU   $CD12     Input character
CD11    INCHEK  EQU   $CD11     Input character no filter
CC1A    LSTBUF  EQU   $CC1A     FLEX list buffer pointer
CC2D    OUT     EQU   $CC2D     Output character
CC21    ARTERR  EQU   $CC21     Input character
CC24    PSHLF   EQU   $CC24     Print CR, LF, and Buffer
CD45    PRCMND  EQU   $CD45     Prepare FLEX command line
CD8D    RSTMD   EQU   $CD8D     Restore FLEX Re-Entry point (See FILESORT termination
                *
                *  "FILESORT" begins here
                *
0400    BEGIN   LEA   *         Program origin address
```

```
0400 10CE0C96  LDS   #STACK     Set stack pointer
0404 BDCC4F    JSR   INITIL     Initialize FILESORT
0407 8E0B13    LDX   #BUFBEG   Point to buffer beginning address
040A 9F19      STX   <$19      Store in temporary pointer
040C 8E0B17    LDX   #BUFPTR   Point to buffer pointer address
040F 9F1B      STX   <$1B      Store in temporary pointer
0411 BDCC1D    JSR   INCHEK    Input character
0414 8D0A      BSR   PARSER    Parse command line
0416 8D0C      BSR   PARSER    Parse parameter limits
0418 8D08      BSR   PARSER    Parse parameter limits
041A 8D06      BSR   PARSER    Parse parameter limits
041C 8D04      BSR   PARSER    Parse parameter limits
041E 8D02      BSR   PARSER    Parse parameter limits
0420 8D00      BSR   PARSER    Parse parameter limits
                *
                *  "PARSER" evaluates the parameter names and associated values
                *  entered from keyboard in binary entry, limits of parameter,
                *  and parameter date format.
                *
0422 9F 31 37 39  PARSER  DEC   /79/,0,0,0,/01/,0,0,0,/32,33,0,110
0426 46 53 20 20          DEC   /FS/,46,83,/20/,46,0,0,/20,20,0,0
042A 00 00 00 00          DEC   /20/,0,0,0,/20,20,0,0,/20,20,0,0
                *
                *  ASSEMBLES
                *
042E 8F 30 0C 48  TCL     TCC   $30,$0F,$1C,$1C,? $0,$C  $/Zero bits 4, Enable  $0e=$0F,$
0432 1C 11 0C 48  BTCL    BCC   $27,$07,/TILSW$48 ABS  $1C1     ;$1C     ISTAT=
0436 8F 10 00 44          TCC   $30,$10,$
043A 8F 20 2F 69  PACK    BCC   / P2:3 /,69
043E 86 2B 3F 04  NCSPAD  BCC   $43,/;CAT/,$27
0442 8F 13 1C 3C  DecMPT  TCC   $30,$13,/;CAT/,/<</  /,<
0446 8F 13 1C 3E  DecMPT  TCC   $30,$13,/;CAT/,/>>/  /,>
044A 86 2B 3F 04  NCSPAD  BCC   $43,/;CAT/,$27
044E 8F 03 40 00  PTMPAD  TCC   $30,$03,/;CAT/,/@ /,0
0452 8F 20 2F 69  PACK    BCC   / P2:3 /,69
0456 86 2B 3F 04  NCSPAD  BCC   $43,/;CAT/,$27
045A 8F 03 40 00  PTMPAD  TCC   $30,$03,/;CAT/,/@ /,0
045E 8F 03 40 00  PTMPAD  TCC   $30,$03,/;CAT/,/@ /,0
0462 8F 03 40 00  PTMPAD  TCC   $30,$03,/;CAT/,/@ /,0
0466 8F 03 40 00  PTMPAD  TCC   $30,$03,/;CAT/,/@ /,0
046A 8F 03 40 00  PTMPAD  TCC   $30,$03,/;CAT/,/@ /,0
046E 8F 03 40 00  PTMPAD  TCC   $30,$03,/;CAT/,/@ /,0
0472 8F 03 40 00  PTMPAD  TCC   $30,$03,/;CAT/,/@ /,0
0476 8F 03 40 00  PTMPAD  TCC   $30,$03,/;CAT/,/@ /,0
047A 8F 03 40 00  PTMPAD  TCC   $30,$03,/;CAT/,/@ /,0
047E 8F 03 40 00  PTMPAD  TCC   $30,$03,/;CAT/,/@ /,0
0482 8F 03 40 00  PTMPAD  TCC   $30,$03,/;CAT/,/@ /,0
0486 8F 03 40 00  PTMPAD  TCC   $30,$03,/;CAT/,/@ /,0
048A 8F 03 40 00  PTMPAD  TCC   $30,$03,/;CAT/,/@ /,0
048E 8F 03 40 00  PTMPAD  TCC   $30,$03,/;CAT/,/@ /,0
0492 8F 03 40 00  PTMPAD  TCC   $30,$03,/;CAT/,/@ /,0
0496 8F 03 40 00  PTMPAD  TCC   $30,$03,/;CAT/,/@ /,0
049A 8F 03 40 00  PTMPAD  TCC   $30,$03,/;CAT/,/@ /,0
049E 8F 03 40 00  PTMPAD  TCC   $30,$03,/;CAT/,/@ /,0
04A2 8F 03 40 00  PTMPAD  TCC   $30,$03,/;CAT/,/@ /,0
04A6 8F 03 40 00  PTMPAD  TCC   $30,$03,/;CAT/,/@ /,0
04AA 8F 03 40 00  PTMPAD  TCC   $30,$03,/;CAT/,/@ /,0
04AE 8F 03 40 00  PTMPAD  TCC   $30,$03,/;CAT/,/@ /,0
04B2 8F 03 40 00  PTMPAD  TCC   $30,$03,/;CAT/,/@ /,0
04B6 8F 03 40 00  PTMPAD  TCC   $30,$03,/;CAT/,/@ /,0
04BA 8F 03 40 00  PTMPAD  TCC   $30,$03,/;CAT/,/@ /,0
04BE 8F 03 40 00  PTMPAD  TCC   $30,$03,/;CAT/,/@ /,0
04C2 8F 03 40 00  PTMPAD  TCC   $30,$03,/;CAT/,/@ /,0
04C6 8F 03 40 00  PTMPAD  TCC   $30,$03,/;CAT/,/@ /,0
04CA 8F 03 40 00  PTMPAD  TCC   $30,$03,/;CAT/,/@ /,0
04CE 8F 03 40 00  PTMPAD  TCC   $30,$03,/;CAT/,/@ /,0
04D2 8F 03 40 00  PTMPAD  TCC   $30,$03,/;CAT/,/@ /,0
04D6 8F 03 40 00  PTMPAD  TCC   $30,$03,/;CAT/,/@ /,0
04DA 8F 03 40 00  PTMPAD  TCC   $30,$03,/;CAT/,/@ /,0
04DE 8F 03 40 00  PTMPAD  TCC   $30,$03,/;CAT/,/@ /,0
04E2 8F 03 40 00  PTMPAD  TCC   $30,$03,/;CAT/,/@ /,0
04E6 8F 03 40 00  PTMPAD  TCC   $30,$03,/;CAT/,/@ /,0
04EA 8F 03 40 00  PTMPAD  TCC   $30,$03,/;CAT/,/@ /,0
04EE 8F 03 40 00  PTMPAD  TCC   $30,$03,/;CAT/,/@ /,0
04F2 8F 03 40 00  PTMPAD  TCC   $30,$03,/;CAT/,/@ /,0
04F6 8F 03 40 00  PTMPAD  TCC   $30,$03,/;CAT/,/@ /,0
04FA 8F 03 40 00  PTMPAD  TCC   $30,$03,/;CAT/,/@ /,0
04FE 8F 03 40 00  PTMPAD  TCC   $30,$03,/;CAT/,/@ /,0
0502 8F 03 40 00  PTMPAD  TCC   $30,$03,/;CAT/,/@ /,0
0506 8F 03 40 00  PTMPAD  TCC   $30,$03,/;CAT/,/@ /,0
050A 8F 03 40 00  PTMPAD  TCC   $30,$03,/;CAT/,/@ /,0
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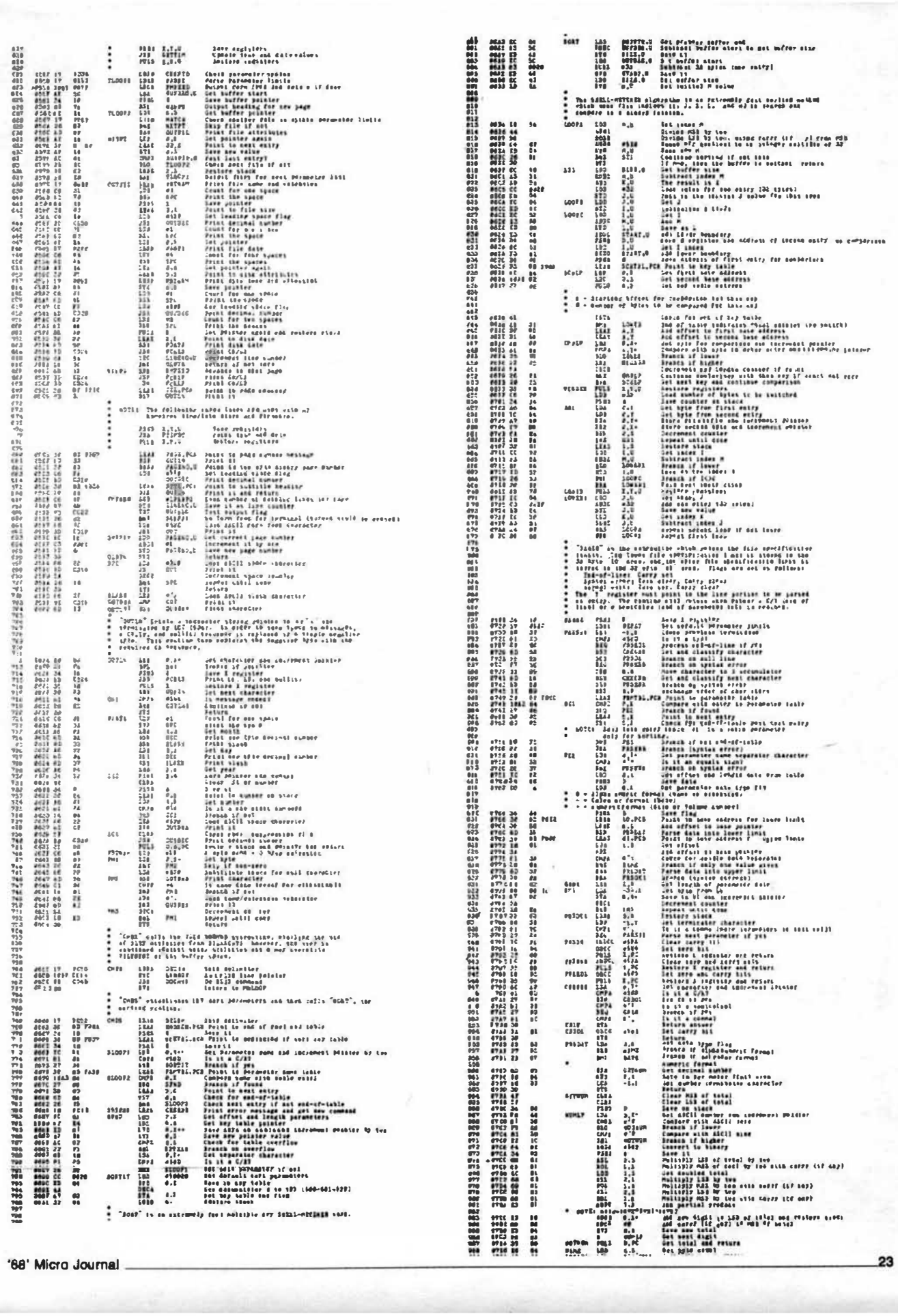

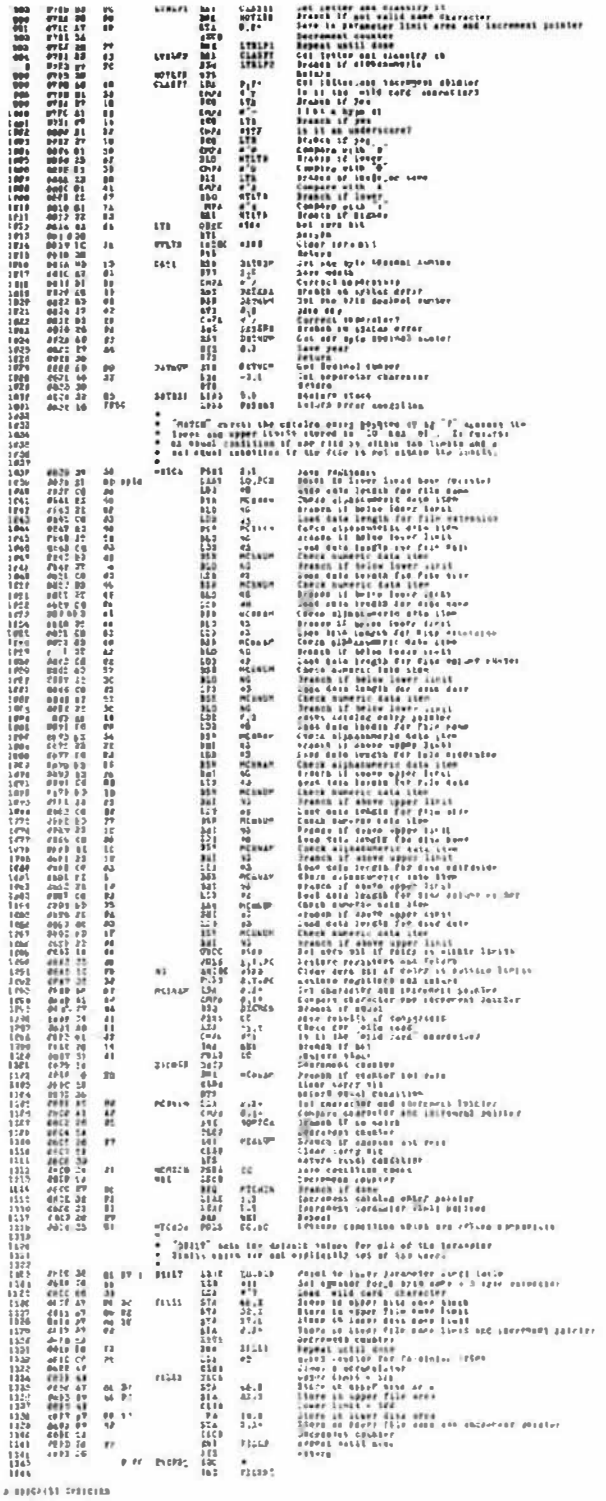

BIT BUCKET

line of the counters are pulsed, the curser will be at that x,y location on the screen.

Sounds easy doesn't it? You just use two 8 bit ports to output the 10 bit word and your in business. But what if like me you only have one 8 bit port available. Well that is where this circuit comes in.

The schematic gives all the information needed in order to build and connect the circuit to the terminal, so I'll just give a brief description of how it works.

In order to position the curser you first output the horizontal position (0-63), and when the data ready line is pulsed low, this 6 bit word will be latched into the registers of IC1,2 & 3. You then output the vertical position (0-15), but first you add 240 to it. This is because the circuit needs a way to tell that this is vertical information, and since we only use 4 bits for vertical data, we can use the other 4 bits as a flag. Now when you output the vertical position (240-255), this will be detected by the 4 input gate of IC5b, and this condition when combined with the data ready pulse, will enable the load lines of IC35,28 & 34. When this happens, the 6 bits being held in the registers are loaded into IC35 & 28 and the 4 bits of vertical data are loaded into IC34. This will imediately place the curser at that x,y location on the screen.

As you can see, the operation of the circuit is very simple. The only things to remember are that the last horizontal data word received is always held in the registers and that the curser is positioned only when vertical data is received.

Now as to the software to drive the circuit. Enclosed is a couple of routines that I have used. The first routine is used to initialize the output port while the second routine is used to output a word to the port and also generate the proper data ready pulse on the CA2 line. The second routine is written to be used by the USR(X) function in BASIC. In this case (X) will be either horizontal or vertical position information. The subroutine when called will output the least significant byte of the 2 bytes stored by the USR(X) function.

I had better end this now, as I have already taken up enough space in this great magazine. Let me just add that although I don't have a schematic for it, I would imagine that this same idea could be applied to the CT-1024.

Sincerely,

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6670 Manson Dr.
Waterford, Michigan 48095
(313-623-7863)

```
** PORT INIALIZATION ROUTINE
** SETS LINES AS OUTPUTS
** ALSO SETS CA2 AS OUTPUT (NORM. HIGH)

INITL   LDX   #PORT     POINT TO OUTPUT PORT
        CLR A
        STA A 1,X       SELECT DATA DIR. REG.
        LDA A #$FF
        STA A 0,X       SET FOR ALL OUTPUTS
        LDA A $$3F      DEF. CA2 AS OUTPUT LINE
        STA A 1,X       SET CA2 TO HIGH STATE
        RTS


** THIS ROUTINE OUTPUTS LEAST SIGNIFICIANT
** BYTE OF TWO BYTES PLACED IN MEMORY BY
** USR(X) FUNCTION, IT ALSO GENERATES
** PROPER PULSE ON DATA READY LINE (CA2)

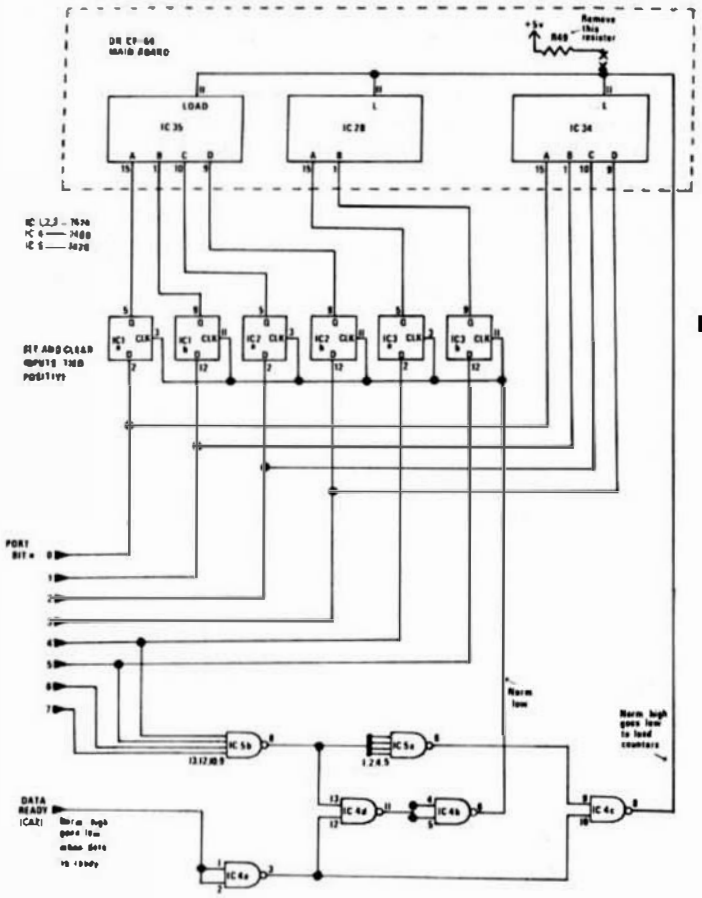
CURSER  LDX   #PORT
        LDA A DATA      GET BYTE FROM BASIC
        STA A 0,X       OUTPUT IT
        LDA B $$37
        STA A 1,X       DROP CA2 LINE LOW
        LDA B 0,X       WAIT
        LDA B $$3F      NOW RESTORE CA2
        STA B 1,X       TO HIGH STATE
        RTS
```

'68' Micro Journal
3018 Hamill Rd.
P.O. Box 849
Hixson, Tennessee 37343

Dear Mr. Williams:

This is addressed to all SWTPC CT-64 owners who have had to sit back and watch as all those other people did all those great things on their memory-mapped displays.

Now you too can join the fun. All you need is a spare 8 bit output port and this circuit, to give your CT-64 a fully addressable x,y curser. The fact that has been kept secret all these years is that the curser position counters are presettable, which means that you can preset the horizontal counters (IC35 & 28), with a 6 bit word (0-63), and the vertical line counter (IC34), with a 4 bit word (0-15). Then when the load



SANSASKA SYSTEMS
3311 Concord Blvd
Concord CA. 94519
March 12, 1981

PRODUCT ANNOUNCEMENT

Sansaska Systems announces the release of two handy reference cards for Motorola CPU based systems. One card is for 6800 FLEX 2.01tm) and the other is for 6809 FLEX 9 (tm). Each is printed on card stock suitable for heavy use. Each card contains the addresses of the public entries into FLEX as well as the definitions for an FCB, FMS function codes and error codes. In addition entries for the more common monitors are provided.

The cards are available for $1.95 + $.25 postage & handling (CA add $.13 tax) from Sansaska Systems, 3311 Concord Blvd., Concord CA. 94519. Please specify which one you want. Dealer inquires invited.

FLEX is a trademark of Technical Systems Consultants, Inc.

microdyne

NEW PRODUCT ANNOUNCEMENT

UNICOMP BT-1
ACTIVE BUS TERMINATOR

- Occupies one S-50 slot
- Allows at least 5 megahertz operation on all standard motherboards
- Presents 120 ohm active termination compatible with bus driver and receiver chips used with Digital Equipment Corporation's Unibus standard
- Maintains compatibility with other chips used on standard S-50 boards

Assembled and tested $75.00

GIMIX INC. 1337 WEST 37th PLACE • CHICAGO, ILLINOIS 60609 • (312) 927-5510 •

March 23, 1981

Don Williams
'68' Micro Journal
3018 Kemill Road
P. O. Box 849
Hixson, Tennessee 37343

Dear Don,

GIMIX is now including three new utilities with their GIMIX FLEX for the GIMIX Double Density Disk Controller. These three utilities are:

USEMPT	Enables users who don't have GIMIX CPU Cards to use the print spooling feature of GIMIX FLEX. It substitutes the SWTPC MP-T for the 6840 as the interrupting device.
USEDC4	Enables the user to read and write double density 5" disks formatted on the SWTPC DC-4 controller.
UNUSE	Enables the user to configure a drive back to normal after using the USEDC4 command.

These utilities, as well as a utility to read and write to SWTPC extended format double density DMF-2 formatted disks, will also be available for the GIMIX DMA Disk Controller.

Any user that would like their disk updated should send their ORIGINAL GIMIX FLEX disk to GIMIX and we will update it without charge.

This eliminates the "incompatibility" problems for users of GIMIX hardware.

Sincerely,
GIMIX INC.

Bob Phillips

UNIVERSAL DATA RESEARCH INC.

2457 WEHRLE DRIVE • BUFFALO, NEW YORK 14221 • 716 631-3011

March 27, 1981

NEW DBM II

We are now releasing the greatly enhanced DBM II; a concise Data Manager and Basic Programming standard. By combining many features into a tighter structed code, we now have more disk space, (run's on a double sided 5" disk). Precompiler compatibility and many new features to mention but a few:

Report Generator - Totalize Fields
Modify Titles
Decimal Alignment
Sorted & Keyed Order Output
Text Processor Compatible Output
Sequential & Spooler Output

Label Printer - Multiple Fields On Each Line
Sorted & Keyed Order Output
Label Alignment

File Routines - 1-45 Fields
0-4 Place Decimal Accuracy
Floating Point Rounding Algorithms
Previous Field Insert/Replace
ISAM Structured Key Files on any Alpha Field
Greater Protection against Accidental Delete
Edit Routines-Multi-feature/Access

The new release is now available to all registered users for $35.00. Please send in your original disk.

ANALOG DIGITAL SYSTEMS
TI
Thomas Instrumentation
6800/6809 COMPUTERS
168-8th Street, Avalon, N.J. 08202
(609) 967-4280

MARCH 26, 1981

48K RAM/ROM CARD
*** 2MHz STATIC ***
INTRODUCTORY PRICE
S-R/R ASSEM. +TESTED $440.00

THOMAS INSTRUMENTATION is pleased to announce the availability of a new static memory card. The card uses the new low-power, off-the-shelf 2016P-2 (2128) RAMs and/or 2716 ROMs. The user may mix any 4K block combination of RAM and ROM. The S-R/R contains 24 2K blocks that may be memory mapped in any 2K boundary in a full 64K system. It is 6800 and 6809 compatible, decoded for extended addressing and runs on 5 volts only. The S-R/R has several exciting features. The cards extremely low power consumption (1/2 amp with 48K RAM) is of special importance. The lack of heat build-up in the chassis will impress most users. The total reliability and compatibility of static as opposed to dynamic is still a major factor to many users when buying more memory. The card can be used on the SS-50 or SS-50C buss.

The best, however, has been saved for last. The S-R/R is fully tested at 2 MHz with standard 250ns chips. 150ns and 100ns chips are available---making the S-R/R the fastest memory card on the market.

Regarding your February issue, '6809 PERFORMANCE TIMINGS', Al Moraire compared the TRS basic to (among others) Lucidata's pascal, claiming the pascal as the winner. The pascal was run using integer arithmetic while the the basic program was using floating point arithmetic. I'm sure that this is not a proper comparison.

R ZEFF
2135 ETONE AVE
ADDESTO, CA. 95351

FOR IMMEDIATE RELEASE

December 1, 1980 Contact: Stewart (213) 644-0113

ELECTRONIC TOOL COMPANY NAMED MASTER DISTRIBUTOR
FOR WAVEMATE CORP. COMPUTER PRODUCTS IN U.S. AND CANADA

Wave Mate,Inc., and Electronic Tool Company today jointly announced a long-term marketing and distribution agreement for Wave Mate computer products and systems.

Under the agreement, Electronic Tool Company will be the sole Master Distributor for Wave Mate computer products in the North American Continent. ETC will provide marketing support, set up regional distributors and retail outlets and also service the OEM market for Wave Mate products.

Products covered under the agreement include the Wave Mate "Jupiter" Series Computers, the newly-developed Wave Mate "2000" series computers, and certain custom systems based on these machines.

In production since September, 1980, the Wave Mate 2000 is a fully self-contained system for small-business, intelligent-terminal, word-processing, and OEM applications. Featuring extensive software support, languages such as XBASIC, FORTRAN, and PASCAL, and numerous application packages,

a typical Wave Mate 2000 System contains a 6809E 2mHz CPU, 64K memory, two 184 kilobyte mini-floppy drives, I/O bus, keyboard and 80x25 display in a single 45-pound package costing less than $3200 in single-unit quantities. Internal space for up to 3 interface modules, plus 2 programmable serial I/O EIA interfaces, make the system ideal for intelligent terminal and OEM applications. In OEM quantities a 64K system with 736 KB disk can be had for less than $2400.

Wave Mate, Inc., founded in 1980 and based in Carson, CA also has distribution in Europe and South America. Electronic Tool Co., founded in 1978, with offices in Hawthorne and Los Altos, CA, is both a manufacturer and distributor of computer products and systems.

'68' Micro Journal
3018 Nemill Road
Box 849
Mimson, Tenn. 37343

Comments on 6809 subroutine linkage

J. L. Wood performed a useful service when he (?) produced the article "6809 subroutine interface" in the February issue. The subject is sorely in need of discussion, but is distinctly missing from the literature.

The author is incorrect when claiming that the "call-by-reference" argument transfer method cannot support recursive and reentrant procedures. Such a statement would emply those have been doing exactly what the author claims is impossible. It would seem that the author has confused the method of generating a data item with the method used to reference it. In the article's Tower of Hanoi example, passing a pointer to the variable "n_min_1" makes each reference as unique as passing the value of that variable.

In the real world, using the "call-by-value" argument transfer method is quite awkward, if strictly applied. If an array or other such extensive data is passed by value, all the data must be copied with the concomitant time and memory space penalty. The author even contradicts his own position when in section 4.5.4 he states that access to arrays should be by reference (pointer). Strict call-by-value makes it difficult, if not impossible, for the called procedure to assign values to the actual parameters.

Some of the higher level languages such as PL/I straddle the fence on the argument transfer method issue by using "call-by-dummy-argument". In this method, pointers to the arguments are passed, but the pointers may reference temporary (dummy) data areas into which the value of actual arguments, such as an evaluated expression, are placed.

The article's method of managing the S stack is adequate, but it fails to address some of the issues of importance to higher level programming languages. Some of the higher level languages such as PL/I and Algol which allow nested procedure defintions require a more complex process to link invocations (execution) with the data they can reference. It is typically necessary to maintain both static and dynamic links so that the currently executing procedure has access to the proper data. The static link provides for the situations related to the lexical (as-written) order of the program while the dynamic linkage provides for the situations related to the execution order of the program. Neither the static nor the dynamic linkage is sufficient by itself to handle all situations, so both are required in the general case.

I have evolved a method for managing the local environment of a procedure which is slightly different from the one given in the article. I use the Y register as the "stack marker", thereby retaining the somewhat more powerful U register for use within the procedure.

```
ACSAVE  SET   *
LOCVAR1 RMB   1
LOCVAR2 RMB   2
REGS    EQU   *
        RMB   0
ARGPTR1 RMB   2
ARGPTR2 RMB   2
        ORG   ACSAVE

entry   PSHS  U,X,Y           Save the registers
        LEAS  -REGS,S         Allocate the local variables
        LEAY  0,S             Set the "stack marker"
        :
        :
        LDD   [ARGPTR1,Y]     D = argument value
        :
        :
        LDX   ARGPTR2,Y       X = argument address
        :
        :
        LEAS  REGS,Y          Clear the stack
        PULS  Y,U,X,PC        Restore the registers and exit
```

If the assembler supports multiple definitions of labels on SET statements, then several independent subroutines can be processed as one "job". The same procedure entry and exit code can be used for all the subroutines in this case. Otherwise, the SET statements can be converted to EQUs and unique names used for each procedure or each procedure can be separately processed.

The method illustrated above has the side benefit of clearing the S stack of any undeclared data items which may have been pushed onto the stack. These items are automatically cleared upon exiting the procedure without having to know how many are present.

It could be argued that the second and third instructions of the illustration should be reversed and the exit code modified accordingly. The local data would then have negative offsets relative to Y while the parameters would have positive offsets, thus more fully utilizing the 6809 four-bit offset's addressing range. However, the illustrated method is easy to main-

tain and the typical procedure doesn't have much local data. Even if the argument pointers are outside the four-bit offset range, those pointers are not often referenced within the typical procedure.

'68' Micro Journal
9 February 1981
Page three

One should be careful about never using absolute addresses for references. If one wishes to have a relocatable which references typical microcomputer OS routines, these references must be absolute. A relative reference will vary with the location of the referencing program, whereas absolute references will not.

Sincerely yours,

Everett M. Greene
504 N. Rano
Ridgecrest, Ca. 93555

Talbot Microsystems
9030 Kensington Way
Riverside, CA 92507
March 23, 1981

Dan Williams, Editor
'68' Micro Journal
3018 Hamill Rd.
P. O. Box 849
Hixson, TN 37343

Dear Dan,

Recently Manfred Peschke submitted to you a letter extending the 6809 Performance Timings of Moreira ('68' Micro Journal 2/81). He compared the prime number search program in two versions of BASIC with the equivalent computation in FORTH using my tFORTH from Kenyon. Manfred told us of his first result (called I in table II and I suggested how to redo MOD to speed it up (it reduced the time by about 40%, called II in table I), but I was still convinced that FORTH should perform much better. A look back at Moreira's assembly language algorithm showed what was happening. The tFORTH MOD word is implemented in high level FORTH, permitting signed arguments (it does a full 32-bit/16-bit division, keeping the remainder only.

Most simply stated, the prime number test is not a very good test for the purpose of comparing languages. The reason is that the time spent in the test is almost entirely dependent upon the way the MOD function is implemented and little dependent upon the particulars of the languages themselves. The set of benchmarks in Kilobaud Oct 1977 provides a much fairer comparison because they provide a means of seperately testing various aspects of a language.

To prove this point and to illustrate the true speed of FORTH, I created another version of the MOD function in tFORTH to perform only the exactly analogous function as in Moreira's assembly listing (shown below as tFORTH MOD III).

This timing shows that tFORTH is approximately a factor of 2 slower than pure assembly code, provided one compares equivalent algorithms. This also shows another feature of the language FORTH: it is easy to isolate the most time consuming aspects of the high level code and redo it in assembly language to improve the speed. Certainly one could do the equivalent in BASIC by USR functions, or by the RUN feature of BASIC09. However, it is easier and more natural to do it in FORTH because the nature of the language is such that the user is closer to machine language to begin with.

For comparison, the MOD III version in 6800 tFORTH takes 1.8 times longer than the 6809 version (same clock speed).

Sincerely yours,

Ray Talbot

Table I: Execution Speed Comparisons of Prime Number Calculations, Comparing Various Ways of Performing the Computation Using tFORTH -- all comparisons with 1MHZ 6809

Source	Language	Feature	Minutes
Peschke	tFORTH	standard MOD I, permits signed arguments	56.2
Peschke/ Talbot	tFORTH	MOD II, restricted to positive numbers	31.2
Talbot	tFORTH	MOD III - exact algorithm used by Moreira, restricted to positive numbers	12.0
Moreira	Assembler	MOD III, restricted to positive numbers	6.2

LISTINGS:

```
MOD I -- the standard word MOD in the FORTH INTEREST GROUP FORTH
         and as implemented in tFORTH:
  : M/   OVER >R >R DABS R ABS U/ R> R XOR
         SETSN SWAP R> SETSN SWAP ;
  : /MOD >R S->D R> M/ ;
  : MOD  /MOD DROP ;

MOD II -- similar to standard except for positive arguments only
  : MOD  >R 0 R> U/ DROP ;

MOD III -- uses successive subtraction algorithm exactly same
           as implemented in Moreira assembler listing
  CODE MOD   2 ,U LDD,   BEGIN,      ,, ,U SUBD,   BRE,
             ,, ,U ADDD,  2 ,U LEAU,  ,, ,U STD,    NEXT,
```

In order to provide the greatest flexibility, the original MOD has been kept in tFORTH, but there has now been added a new word called UMOD which implements the weighted algorithm III.

JOHN P. TUCKER
Post Office Box 2898
Laredo, Texas
78041
March 5, 1981

Dear Don,

HOORAY FOR YOU!

Very seldom do I acknowledge my support, or lack thereof, of editorials appearing in various publications. Those editorials are what the "Freedom of the Press" amendment to our constitution is all about. It is important that one be allowed to express his opinion, whether I agree with it or not.

However, this time I must write!

It would be difficult for me to be more supportive of an idea than the one you expressed relative to the Iranian situation. It remains a "situation" even today, but the lack of mass publicity about it has let it slip from the mind of the general public. This is most unfortunate as a danger, clear and evident to even a casual researcher, still lingers.

I do take one small exception to your editorial. You terribly understate the case when you say, "Maybe it is of little importance what a small magazine does..."

Don, it is not of little importance what one INDIVIDUAL does. What even a small magazine does is of real importance to America and its future.

As ever,

John

John

David Hanon
Box 237C Rt 6
Ringgold, Ga
30736
March 16, 1981

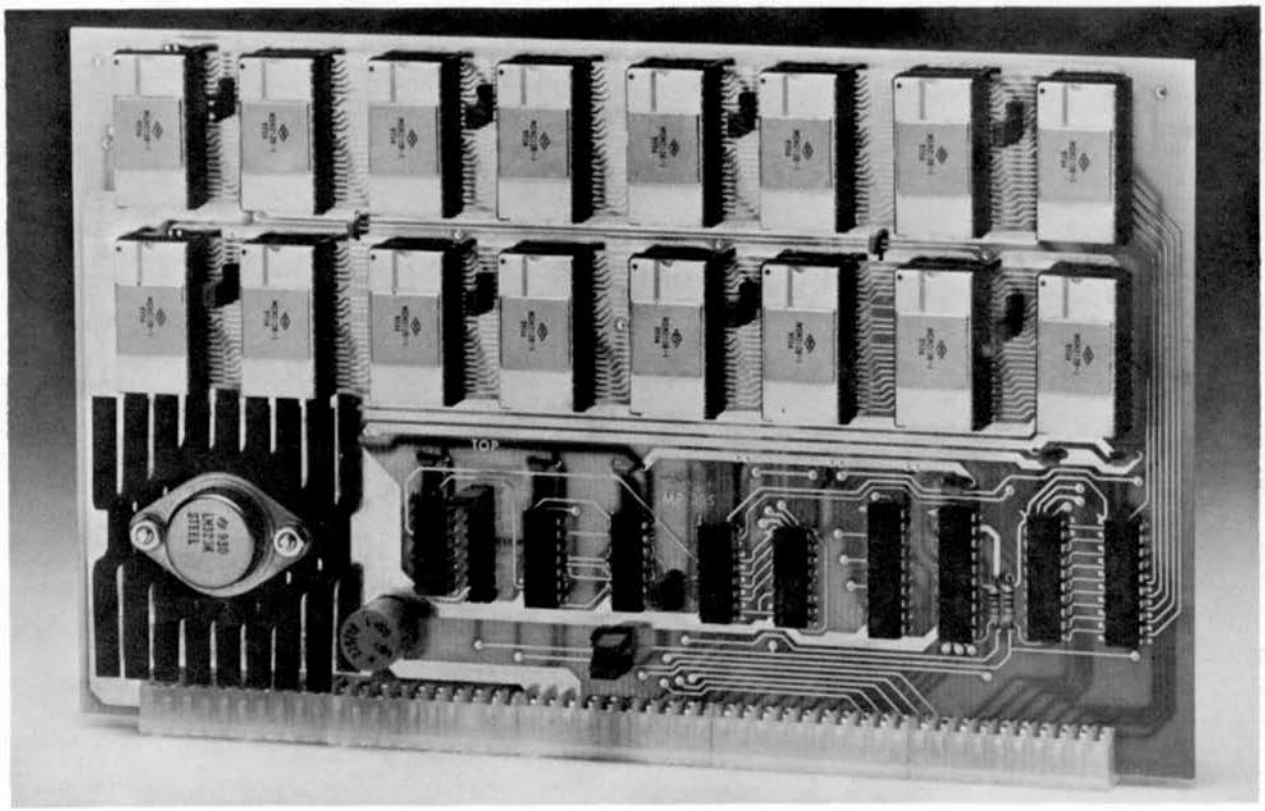
Mr. Don Williams
68 Micro Journal
3018 Hamill Rd.
Hixson, Tennessee 37343

Dear Don:

I have noted your criticism of the Radio Shack TRS-80C color computer in recent articles and I appreciate your interest in guarding the quality of the products offered to the 68XX community. I also think that praise should be given to a vendor when warranted. In view of this I would like to relate my recent experience with my TRS-80C.

In December of last year I bought a TRS-80C and 15 minutes after getting home with it I had exchanged the memory chips with 16K chips and was up and running. I was very pleased with the computer and as soon as the extended basic became available I sent it back to the store where I bought it for the "basic" upgrade. The computer came back from the service center within 4 or 5 days and the store manager was kind enough not to charge me with an installation fee as shown in the catalogue and there was no complaint about my having added my own memory.

The extended basic is very powerful and the color graphics (the reason I bought the machine) features are outstanding. All went well for a few days until the machine failed to boot up. I wondered what problems I



UNIVERSAL STATIC MEMORY

★ 32K bytes - ROM, RAM, EPROM or a combination
★ SS-50 A&C compatible with 16 and 20 bit address decoding
★ Compatible with all SWTPC 6800 and 6809 computers
★ 2.0 MHz - 5.0 Volts only

This is the most versatile memory card you can buy. Our S-32 may be populated with up to 32K of static RAM, EPROM, or ROM, or any 4K block combination of these that you may desire. Any 5-volt 2716 pinout compatible memory may be used in this card. Any 4K block of memory may be jumper block programmed for RAM or ROM use. This feature makes this the ideal memory for those process control applications that require a mixture of ROM and RAM memory. The board is fully compatible with all SWTPC 6800 and 6809 computers.

The power requirement for the board is only 1.75 amps at 5.0 volts with a full 32K of RAM installed.

S-32 Circuit card only . . . . . $ 99.50
S3216 with 16K of RAM . . . . . $295.00 ea.
S3232 with 32K of RAM . . . . . $495.00 ea.

SWTPC

SOUTHWEST TECHNICAL PRODUCTS CORPORATION
219 W. RHAPSODY
SAN ANTONIO, TEXAS 78216 (512) 344-0241

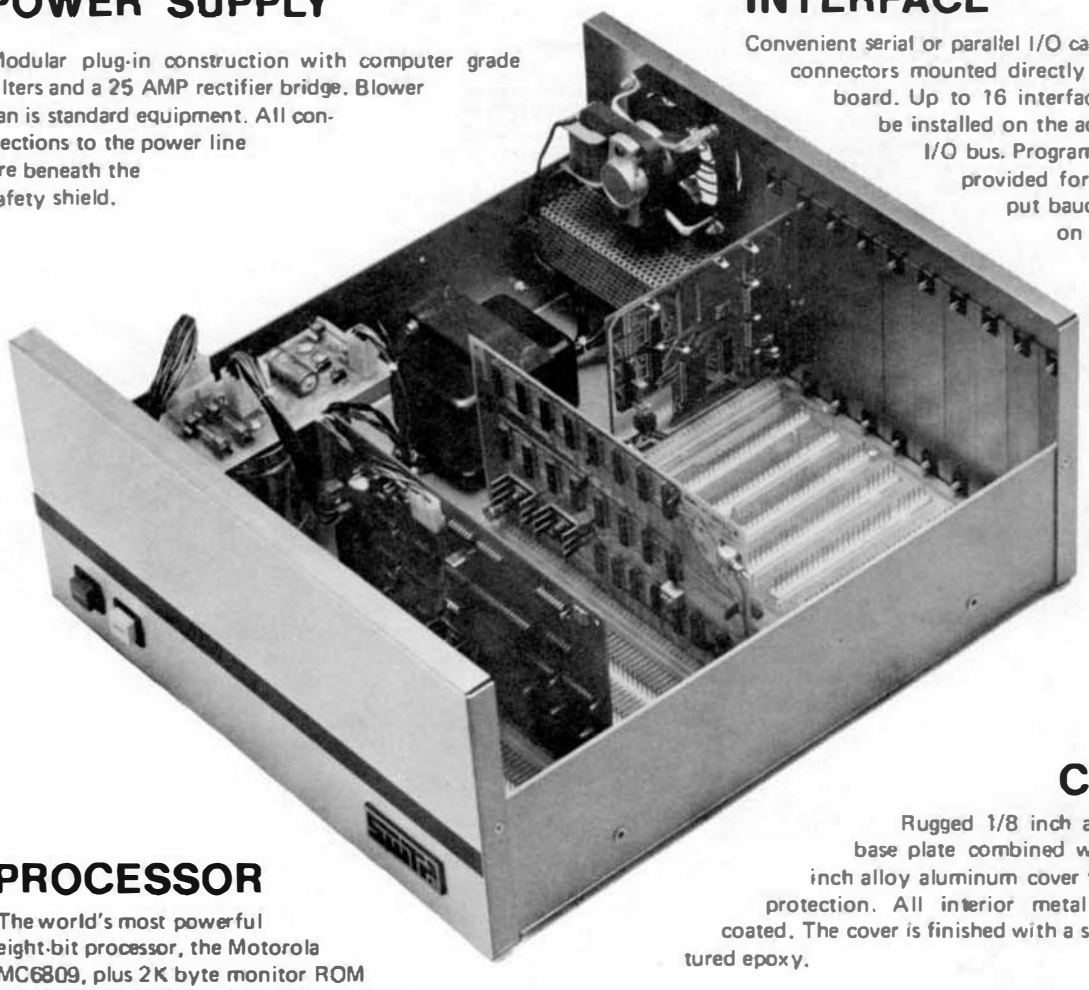
WE HAVE A 6809 FOR YOU

POWER SUPPLY

Modular plug-in construction with computer grade filters and a 25 AMP rectifier bridge. Blower fan is standard equipment. All connections to the power line are beneath the safety shield.

INTERFACE

Convenient serial or parallel I/O cards have DB-25 connectors mounted directly on the circuit board. Up to 16 interface devices may be installed on the address decoded I/O bus. Programming strips are provided for input and output baud rate selection on each port. All outputs are fully buffered.



CABINET

Rugged 1/8 inch alloy aluminum base plate combined with a solid 1/8 inch alloy aluminum cover for unsurpassed protection. All interior metal is conversion coated. The cover is finished with a super tough textured epoxy.

PROCESSOR

The world's most powerful eight-bit processor, the Motorola MC6809, plus 2K byte monitor ROM that is 2716 EPROM compatible and full buffering on all output lines. Built-in multiuser capability, just add I/O cards to operate a multi-terminal system.

MEMORY— You can purchase the computer with either 8K bytes of RAM memory (expandable to 56K), or with the "S" series 64K bytes of RAM memory expandable to 768 K.

PERIPHERALS—The wide range of peripheral hardware that is supported by the 6809 includes: dot matrix printers (both 80 and 132 column), IBM Electronic 50 typewriter, daisy wheel printers, 5-inch floppy disk system, 8-inch floppy disk systems and a 16 megabyte hard disk.

SOFTWARE— The amount of software support available for the 6809 is incredible when you consider that it was first introduced in June, 1979. In addition to the FLEX9 operating system, we have a Text Editor, Mnemonic Assembler, Debug, Sort-Merge, BASIC, Extended BASIC, MultiUser BASIC, FORTRAN, PASCAL and PILOT.

69/K Computer Kit with 8K bytes of memory ..... $ 575.00
69/A Assembled Computer with 8K bytes of memory ..... $ 695.00
09/ Assembled Computer "S" series with 64K bytes of memory $1,595.00

SWTPC

SOUTHWEST TECHNICAL PRODUCTS CORPORATION
219 W. RHAPSODY
SAN ANTONIO, TEXAS 78216 (512) 344-0241

might have since I had technically voided my warranty by adding the memory expansion. I took the unit to the Radio Shack store in Rossville, Ga., where I had purchased it and told the manager to send it for repair and to advise me if there would be a repair charge due to my voided warranty. After a few days I heard from the store manager and he said that the problem didn't appear to be related to my added memory and it would be back in a few days. I recieved the computer promptly and it worked perfectly. There was no charge to me for the replaced logic gate and two hours labor.

I don't know whether your editorials and communcation with Tandy have influenced their policy or not but I thought it would be worth letting you know my satisfaction with my TRS-80C and particularly with the service obtained from my local store.

Keep up the fine job on the magazine.

Yours truly,

David Hanon

Robert Lund
516 E. LaLonde
Lombard, Ill. 60148
Phone: (312)547-0611

March 19, 1981
'68' Micro Journal
3018 Hamill Rd.
PO Box 849
Hixson, Tennessee 37343

Dear Bits,
Please consider the following for publication...

SWTP CO-RESIDENT EDITOR ASSEMBLER PATCH:
The following code will enable the SWTP Cores editor-assembler to output a listing on a printer on another port.
To use this patch first modify cores with the following code, then initialize the PIA on port 0 with the SWTBUG commands "O 8". Now after entering your source, but before assembling, use the command "PR". Now all output, except "WHICH PASS" will go to the printer.
On first inspection, one would assume that the output would be echoed on both the terminal and the printer, but this is not the case. All output goes to the printer except "WHICH PASS?" As before, CNTRL X will return you to the editor. Also, "PR" before listing will output your source to the printer.
This patch was the result of some late night hacking and may not work on all versions of Cores, so a word of caution is in order. Don't modify your only copy, back it up first!
Lines 310,140.470, and 460 contain the original Cores code. So if your version is the same at these locations, this patch will work.

Sincerely,
Robert Lund

```
00010                    NAM    PATCH
00020                    OPT    NOP

00040                *************************************
00050                * PATCH FOR SWTP CORES ASSEMBLER    *
00060                * TO OUTPUT TO PRINTER.             *
00070                *                                   *
00080                * PA <RETURN> BEFORE LIST OR        *
00090                * ASSEMBLE WILL OUTPUT TEXT TO      *
00100                * PRINTER AND THEN RETURN TO        *
00110                * CONTROL TERMINAL. USES SWTBUG     *
00120                * OUTEE SUBROUTINE AT $E1D1         *
00130                *                                   *
00140                * PRINTER = SERIAL PIA PORT 0       *
00150                * TERMINAL = ACIA ON PORT 1         *
00160                * Robert Lund 2/22/81               *
00170                *************************************

00190                * SYSTEM EQUATES *
00200      8000      PORT0  EQU    $8000
00210      8004      PORT1  EQU    $8004
00220      E1D1      OUTEE  EQU    $E1D1

00240                * INITIALIZE *
00250 17B1           ORG    $17B1
00260 17B1 CE 8000   LDX    #PORT0
00270 17B4 FF A00A   STX    $A00A      FOR SWTBUG
00280 17B7 01        NOP               *
00290 17B8 01        NOP               * DELETED
00300 17B9 01        NOP               * INSTRUCTIONS
00310 17BA 01        NOP               *
00320 17BB 01        NOP               *
00330 17BC C6 FF     LDA B  #$FF
00340 17BE F7 01C8   STA B  $01C8

00360                * OUTPUT CHARACTER *
00370 1A86           ORG    $1A86
00380 1A86 C6 00     LDA B  #$00
00390 1A88 F7 A00B   STA B  $A00B       SWITCH TO PRINTER
00400 1A8B BD E1D1   JSR    OUTEE       PRINT CHAR. IN A
00410 1A8E C6 04     LDA B  #$04
00420 1A90 F7 A00B   STA B  $A00B       SWITCH TO TE M.
00430 1A93 01        NOP                *
00440 1A94 01        NOP                * DE ETED
00450 1A95 01        NOP                * INSTRUCTIONS
00460 1A96 01        NOP                *
00470 1A97 C6 FF     LDA B  #$FF
00480 1A99 FE 01CA   LDX    $01CA
00490                END

TOTAL ERRORS 00000
```

TRS80 COLOR

16 Balmoral St.
Andover, MA 01810
9 March 1981

Don Williams, Jr.
68 Micro Journal
P.O. Box 849
Hixson, TN 37343

Attached are some ramblings on the Radio Shack TRS-80C. They may be useful as "TRS-80c Hints"--which seems to be becoming a regular feature(!).

Bob Margeson

Bob Margeson

TCD630
70310,303

(MORE) TRS-80C HINTS

Once the warranty has expired (or you can not wait any longer) you can remove the seven screws in the bottom and remove the cabinet top. (Three of the screw holes in the bottom are not used. Note which ones they are!) Also - note that the two short screws go on the keyboard edge; the longer screws go in the other five holes.

CAUTION: Once inside the case - use caution to prevent static electricity from damaging components. (Touch chassis ground with hand or tool on entry. Don't shuffle your feet on the rug. Etc.)

Remove and discard any tape which may be securing the large, shiny metal RFI cover. This cover is held in place by metal fingers around it's edge. Remove this cover by gently prying up a little at a time all the way around.

Item #1.
With FLAT black spray paint, put a thin coat on the inside and outside of the metal cover. This is for improved heat dissipation. (Don't paint the inside surface of the metal fingers.)

Item #2.A
Going from 4K to 16K Memory.
As mentioned in 68 Micro Journal, January issue, page 17, and in Byte, March issue, page 114, increase RAM memory by removing the eight existing 4027 RAM chips and replacing them with eight 4116 chips. (I use NEC PD416-1 chips with good results.) There are two (plainly marked) jumper clips which get moved from the "4K" position to the "16K" position. A piece of cake!

Item #2.B
Going to 32K Memory.
As mentioned in Byte, March issue, page 124, RAM chips may be piggybacked to get 32K of RAM capacity.
1. Use the 'Diagnostic' pack to do the "Long RAM test on 16K of memory. Note: The "Q"uick and "L"ong diagnostic tests are "dumb" and will only test a maximum of 16K.
2. Then repeat the "L"ong RAM test on a second set of eight 4116 type RAM chips.
3. Now piggyback one set of eight chips on top of the other. Push them together only far enough for one chip pin to contact the other. Observe pin #1 orientation on both chips. With a small soldering iron quickly tack solder each of the pins together (EXCEPT for pin #4 of the top chip which gets carefully bent out to the side.)
4. Install the eight chip pairs back into the sockets. Observe orientation.
5. Use some small solid wire (#30 wire wrap) to connect together all of the #4 pins of the top chips. Use a minute amount of solder or wire wrap.
6. Then use another longer piece of the same type wire to connect this series of #4 pins to pin #35 of the SAM chip (6883). Just push the (uninsulated) end of the wire into the SAM chip socket. No soldering necessary on the main board itself!

That's it - you now have a 32K TRS-80C !!

When you put everything back together, and apply power, if you enter "?MEM" - you will see "31015". And if you enter "CLEAR0","?MEM" - you will see "31215". It should take awhile to outgrow that!! But like everything else - a word of caution is in order here too. Be aware that address mapping results in the SAM Register (FF60-FFDF) appearing at 8F60-8FDF !

Several additional items which you might consider doing at this time (or the next time you're inside the machine):

Item #3.
Install a voltage transient suppressor across C22 on the power supply board. For insurance ... .

Item #4.
Remove two screws holding the power transformer to the bottom cover. Unclip one wire and swing the power supply assembly out of the way. Then with about a 3/8th inch drill, drill from the inside - through the soft bottom plastic to make a series of air holes. (Don't do this on the dining room table!) Avoid the area of the foot (It's on the underside!). Drill holes inside the plastic transformer cavity and around the outside of the cavity well. Avoid having the plastic chips fly off and get lost under the circuit board! Clean up. Put

the power supply assembly back in place. Attach the wire clip. Insert two screws to hold the assembly in place. The purpose of this exercise is to improve the (cooling) air flow around the power transformer

Bottom cover goes on in reverse order. Pop the metal RFI cover back on. Place the top cover back on, turn over the machine and reinstall the five long screws and the two short screws. Avoid the three unused holes (The center one will do a bad job on the keyboard ribbon cable - BEWARE!).

On the ROM Packs:
The March issue of 68 Micro Journal, page 14 describes opening the pack. Several of the packs (the "cheap" ones) only use one ROM chip, yet contain space for two. Your own program can occupy this space if you: Disable the FIRQ signal with tape, as described in the above reference, or by drilling the solder out of the hole connecting the two pins. Use a #57 drill. Then use a "solder-sucker" or "wick" to remove the solder from the unused 24 pin space and also the two holes for an additional by-pass capacitor. Install a low-profile 24 pin socket and a 0.01 or 0.1 Mfd capacitor. Your own ROM may now be installed. You may consider using a miniture DPDT toggle switch to alternately connect the Chip Select line of the ROM's (and put the unselected ROM's Chip Select line at +5 volts). Five volt 2716's will work, but a 2732 will get you out of some addressing problems. (This assumes that you are not using 2764's !!)

If you have the "Diagnostics" pack, the basic BASIC ROM CRC is 9505. The extended ROM CRC is ????.

Misc.
CLOAD or CLOADM - Look in 01E5-6 for the transfer (starting) address. Locations 01E7-8 contain the beginning tape load address.

1.8 MHz Clock - After doing a "POKE 65495,0" my keyboard is "dead". Is yours? Need a 68B21 ??
Good Luck !!

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For Sale: Two each 6800 MP-A2 CPU cards. Both in excellent, working condition. Modified to bring out 9600 baud clock on 150 baud bus line. One card contains SWTBUG $70.00 and the other card is $65.00-- John Tarvin, 14480 Shadowlane Court, Morgan Hill, Ca 95037 (408)683-0287.

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###

HELP

Hi,

Help. Need help, just recently got my SWTPC finished and gave it the smoke test. No smoke, but nothing else either. Would like to know if anyone would be willing to help? Would pay postage for correspondence.

Also, I hope you guys at the Journal don't forget the 6800 duffer. Lately there has been alot of 6809 and disk. Lots of programs for this and that. Well, if I had a system up and runninng I'd probably be interested. But, I haven't got to that point yet. Also, what happened to the Cassette based coluen?

You guys have a wonderful opportunity with access to subscribers to get a Bug Book or sheet or pamphlet or something together for repair of 6800's or 09's or whatever. You could have fixes for problems, problem identifications, stuff like that. So that when problems arise outside of ones' technical experience a place or source to go to would be available. So panic and desperation don't have to set. There is a need for such a Bug Book. Even though 09 is pushing 6800 into the woodwork, it still is a good system to work around.

There have been a few fixes and MOD's in the Journal, but nothing that would help me or my system in its stillborn condition.

Also, I really appreciated the letter who informed of abandonment of 6800 systems by SWTPC. So please don't forget us amateurs out here with the ancient 6800.

Would appreciate your thoughts on the Bug Book idea. And maybe someone could help me bring my system to life. Ray Baumiller 1696 4th Street Ext Monongahela, PA 15063

HELP

#####

Two HELP items; (a) We have a need for a program that will accept Baudot input, automatically search for the speed of transmission, and output ASCII. Will build necessary hardware if any required, but prefer software approach. Has this been covered in '68' Micro Journal? If not, can any reader assist us? (b) Would like to contact the engineer-in-charge at an AM radio station using a directional antenna; have applicable programs that need testing; needs system with two disk drives operating under either miniFlex or Flex 2.0. (Program limits at present are for 2,3, or 4 tower arrays, hope to develop for more towers.) John Tucker P.O. Box 2898 Laredo, Texas 78041

help

Dear Sirs,
How do you do the following with TSC's
Text processer:
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Where 10 Bond Street would be read from
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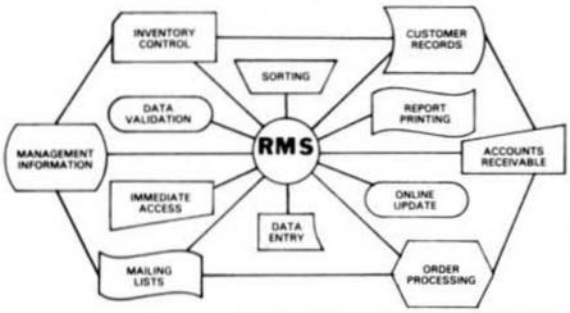

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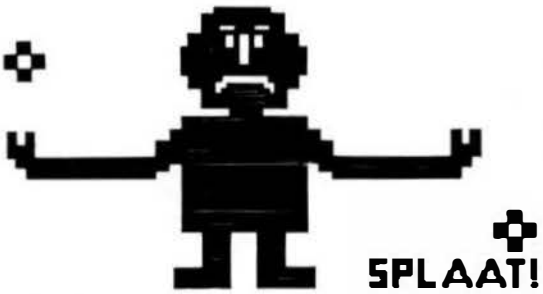

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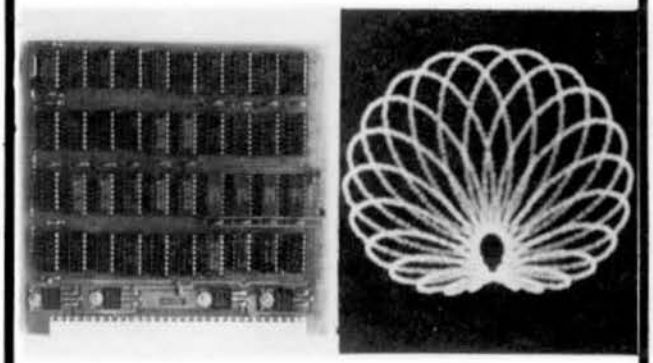

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ABOUT THE AUTHOR

John Wakerly is a computer engineer who has designed microcomputer hardware and software systems in industry, and who has also taught computer engineering to freshmen through graduate students at Stanford University since 1974.

Two years ago Prof. Wakerly set out to write a definitive computer organization and assembly language programming book using microcomputers as examples. He found that the Motorola 6809 had the very best architecture from a pedagogical point of view. Today, he is an avid 6800 and 6809 programmer, and he uses a 6800 based word processing system to write textbooks.

ABOUT MSE BOOKS

MSE Books is a subsidiary of the author's consulting firm, Micro Systems Engineering. Although MICROCOMPUTER ARCHITECTURE AND PROGRAMMING will be available through bookstores, there are several advantages to ordering directly from MSE Books: 10% discount from publisher's list price of $27.95; prompt delivery; convenient payment methods (charge it!); and automatic notification of any updates. Also, the author will autograph your copy upon request!

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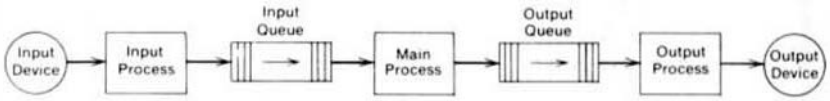

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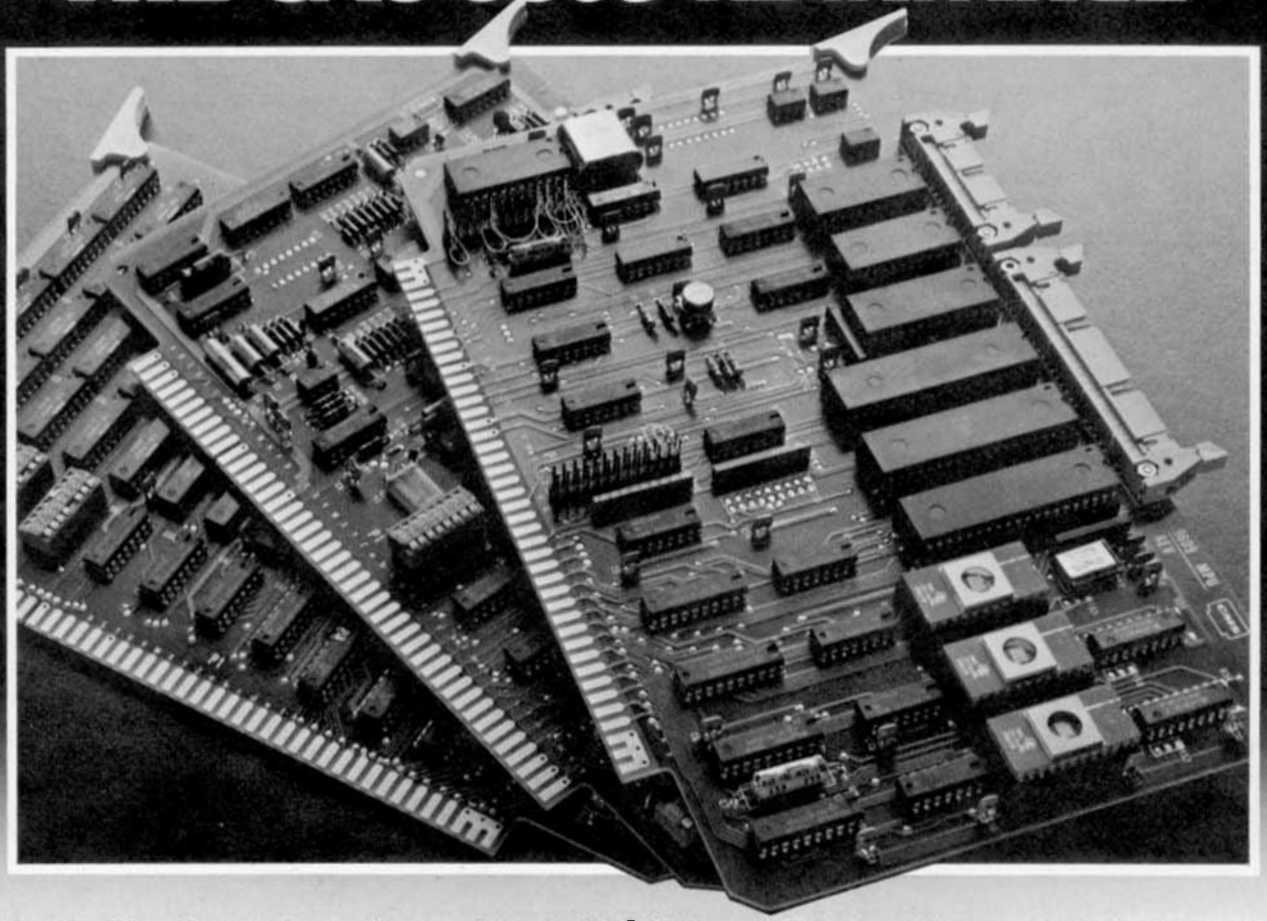

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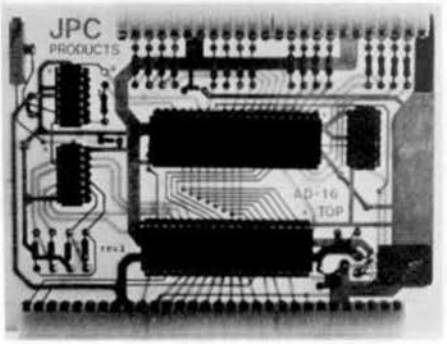

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HUMBUG-09 provides the common functions and commands of your present monitor, but adds full trace and debugging facilities. With it you can single-step programs, insert and keep track of multiple breakpoints, dump memory, abort and continue programs, and more. You can switch I/O ports during execution of a program, link to user-supplied I/O routines or video boards, even pause when the screen is full.

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The initial version is for systems using the SWTP MP-09 CPU board and less than 64K of RAM; it does not support the DMF-2 disk. (Alternate versions available, including video-based versions). The price of $75 includes two ROMs, complete manual, and either full, commented source listing or source code on disk — you choose!

And here's an offer you can't refuse: If you buy our 6800 HUMBUG, we'll give you full trade-in credit when and if you decide to upgrade to HUMBUG-09. See our ad in last month's issue for our other fine 6800/6809 products, or send s•a•s•e•. For information.

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DISCOVER THE 6809 IN YOUR COLOR COMPUTER!

Now you can explore the Radio Shack Color Computer's impressive potentials—as an inexpensive development system, a color peripheral, a process controller—ad infinitum. The Micro Works introduces these powerful software tools for utilizing the color computer at the assembly language level.

MONITOR TAPE: A cassette tape which allows you to:

- Examine or change memory using a formatted hex display
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- investigate and activate features of your computer, such as hi-res graphics or machine-language music
- Use your color computer as an intelligent peripheral for another computer, a color display or a 6809 program development tool

The monitor has 19 commands in all, and is relocatable and re-entrant.
60C Monitor Tape Price: $29.95

MONITOR ROM: The same program as above, supplied in ROM. This allows BASIC to use the entire RAM space. And you don't need to re-load the monitor each time you use it. The ROM plugs into the Extended Basic ROM Socket or a modified ROMPACK.
60C Monitor ROM Price: $39.95

INSIDE THE COLOR COMPUTER: This package is a disassembler which runs on the color computer and enables you to generate your own source listing of the BASIC interpreter ROM. Also included is a documentation package which gives useful ROM entry points, complete memory map, I/O hardware details and more. Disassembler features include cross-referencing of variables and labels; output code which can be re-assembled; output to an 80-column printer, small printer or screen; and a data table area specification which defaults to the table boundaries in the interpreter ROM. A 16K system is required for the use of this cassette.
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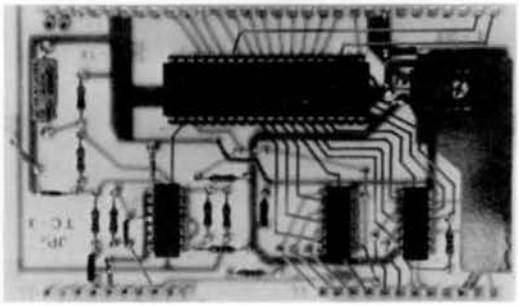

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XREF a cross reference patch $15

Adds a symbol cross reference assembly option to the Percom assembler (base & DIXIE-modified versions). Source code supplied on disk. Manual.

See review of DIXIE and XREF in Nov. '80 issue of '68' MICRO and note that the Percom SUPER BASIC patch and the MPX-to-DIXIE disk conversion utility are both now completed and supplied with the DIXIE package.

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MICROPRODUCT BULLETIN

Why SSB?

Let's face it, some of you just don't know who Smoke Signal Broadcasting is and what we provide for the 6800, 6809 and SS-50 user. This bulletin will be the first in a monthly series appearing in this magazine, and for starters we'd like for you to get familiar with us.

The Products. Since 1977, we've been designing, developing and manufacturing microcomputers — and associated products — based on Motorola's 6800 and 6809, and configured to the SS-50/SS-50C Bus.

Our **CHIEFTAIN** Series of microcomputers range over a broad span of configurations to fulfill any capacity need. The **CHIEFTAIN** 822 is a 5¼-inch dual drive/dual density 6800-based system with 32K RAM (expandable). It's priced at only $3498.00.

The 9624 is a dual 5¼-inch octodensity 6809-based system with 1.6 Mbytes of disk storage, priced at only $4028.00.

A **CHIEFTAIN** 9822 is the dual 8-inch double-sided dual density computer system, taking full advantage of the 6809, priced at a mere $4678.00. Eight-inch Winchester computer systems are also available in either 10 Mbyte (98W10) or 30 Mbyte (98W30) storage configurations.

The Hardware. All of our boards and complete systems are **Endurance Certified** to completely assure you of the latest in industry-standard and state-of-the-art technology. Our DCB-4 Double Density Controller Board ($449.00) became the Standard Controller Board for the 6800 and 6809, handling up to four 5¼-inch and four 8-inch drives simultaneously. Smoke Signal provides the most innovative solutions for the 6800/6809 SS-50 Bus structure that money can buy.

The Software. Five operating systems (including FLEX and OS-9 Multi-User) are running on the **CHIEFTAIN** Series with NO configuration problems. SSB DOS68D and DOS69D (each $75.00) were developed in-house and have become leading standard operating systems.

Smoke Signal provides Business Application Software to fulfill all vertical needs of the business person who is automating.

Our systems software, in conjunction with our DOS, will accomplish any task from text editing and processing up to our Super MACRO-ASSEMBLER that will produce code for every Motorola 6800/6809 family of processors available.

OS-9 Level One and Level Two are the new multi-user and multi-tasking operating systems that will make the 6809 reach the highest potential. COBOL, FORTRAN, Random File BASIC, Pascal, FORTH, and SDBASIC (compiler) are all available for the **CHIEFTAIN**.

Convince Yourself:

Prices. SSB does not sacrifice quality for low cost. The **CHIEFTAIN** Series of computers are **not** expensive, yet are the absolute best 6800 or 6809 computers you can buy!

SOME OF OUR PRODUCTS:

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CHIEFTAIN 9624	4028.00
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CHIEFTAIN 98W10	8698.00
CHIEFTAIN 98W30	9998.00
M-16-X (16K RAM)	299.00
M-24-X (24K RAM)	439.00
M-32-X (32K RAM)	539.00
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SSB DOS (68D or 69D)	75.00

All CHIEFTAINS come **standard** with 32K of RAM; Two Serial I/O Ports; SSB DOS68D or 69D; two disk drives; 6800 or 6809 CPU; a DCB-4; cables; power supply and LMB-1 Motherboard. All connectors are gold-plated. You receive complete and accurate manuals with every product.

Smoke Signal Broadcasting provides support. We will stand behind every product that goes out the door, and you can hold us to that. We realize that this is a time when other manufacturers are playing number games, and forgetting quality for the sake of quantity. Ask any SSB user about our factory support. If **that** doesn't convince you, **nothing** will!

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ALL IN ONE for only $45 00
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Mailing Lists - Use any CRT terminal and printer

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Supports Text Processing commands such as block copy, block move, centering, margin justification (w de and narrow), paging, and tabbing.

M iling Lists and Labels. Use the same mailing list disk file (with protected areas) for both mailing labels and re at letters. Re at letters are personally adressed to each person or selected persons on the mailing list.

Most P werful File Handler found in any editor. Append one fi e to the end of another, or insert (merge) one file into another as designated by the line pointer. Print specified area to your printer or to a disk file. Edit files larger than the text buffer. Does not produce output files when not desired. Delete disk files from the editor.

Printer commands. Control characters can be sent to the printer for format control either directly from the control terminal or by imbedding them in the text. The set command contains interface initialization and character output routines to support the SWTPC MP-C interface as well as the standard serial and parallel inter aces. Jumpers are also provided to user supplied printer routines. User selects the port address (0 thru 7, A or B) thereby eliminating the need for the user to install printer software routines. Editor can be initialized for either 4 or 16 addresses per port.

Editor allows exiting to either the monitor or DOS and then reenter (Warm Start) without destroying previously prepared text in the buffer. The Restart command erases contents in t e buffer without the user having to reload the Editor.

The Editor allows the user to toggle between full duplex (no echo) and half duplex (echo) as needed. It responds to commands in both upper and lower ca e and can be used to create assembler source code and Basic programs as well as text.

Specify 6800 or 6809, SSB or FLEX™, 5" or 8" 45 00
Printed source listing is available for an additional 35 00

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SA-1 Assembler (based on TSC Ass mbler) 29.00
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SEE GIMIX AD PAGES 3 & 56

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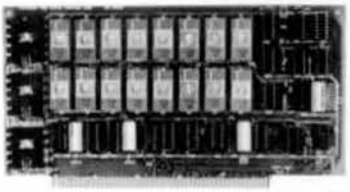

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USES 2716's

Blank PC Board - $34

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$379.00 KIT

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Fully Assembled, Tested, Burned In Add $30

NEW!

At Last! An affordable 32K Static RAM with full 6809 Capability.

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7. Fully bypassed. PC Board is double sided, plated thru, with silk screen.

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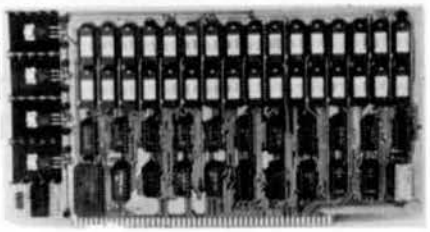

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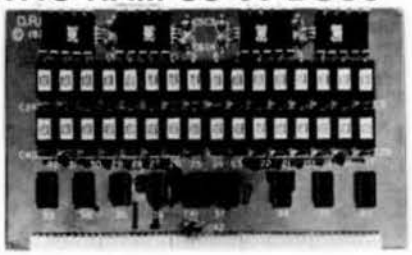

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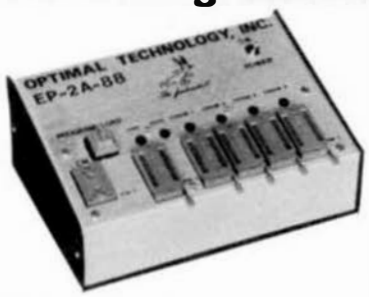

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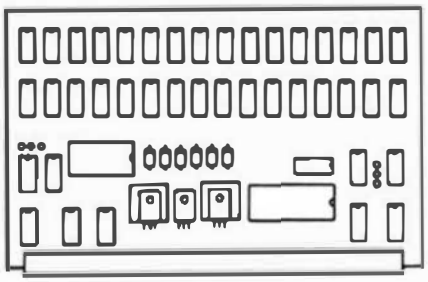

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RESULTS

For many of your users, a convenient and attractive package will be as important as the stuff that's inside. Your ultimate 6800 system will have to be more than a collection of modules, boxes, and power supplies if it is going to serve users who want Results as much as they want technology.

Your ultimate 6800 system won't forget OEM'S and Systems Houses either. Real-world applications usually call for modularity, adaptability and flexibility. You want to make sure that your ultimate 6800 system has both RS-232 serial interfaces and parallel input-output. If possible the system will provide space and power for custom circuitry inside the main enclosure.

As you spend endless hours thinking and planning the ultimate 6800 system, one question keeps coming up, time and time again: how can you include all of these wonderful features in the system and still keep the cost down so that low price will be a benefit, too?

A BREAKTHROUGH

One night you wake up and suddenly know the answer! The answer is to put your ultimate 6800 Computer in the same box with a high-quality, human-engineered keyboard/display. That wey you can save the expense of separate boxes and make a product which really is the ultimate 6800 system. By choosing a terminal design that incorporates microprocessor control, full-function keyboard and high-resolution characters you can add the benefits from hundreds of thousands of development dollars to your design and still have the best price/performance in the industry.

THE WAVE MATE 2000

What you have done is design the Wave Mate 2000, truly the ultimate 6800 Computer system. This compact and attractive Computer takes up no more space than an office typewriter, yet has the power of a full-blown system. It's more than just another pretty face, too. Everything inside the two-tone grey enclosure is built for long life and high performance.

You can't help but feel that the 21st Century has really arrived when you start the system just by turning on the power and sliding in a disk. Within a second or two a beep comes from the annunciator, telling you that the Z-80 keyboard-display controller has found itself in good working order. A few moments later a second beep announces that the 6800 CPU has successfully tested all 64K of memory. The disk drive loads your system in seconds, and you're on your way!

Whether you have a disk drive in your main Series 2000 enclosure or have all of your disks outboard, you can still have up to 2.8 megabytes of dual-density 5.25 inch floppy disk storage...or as little as 180K bytes. And if you need more storage, there's a Winchester waiting just for you.

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The performance of a plain old 6800 system isn't bad. The performance of the Series 2000 is TWICE AS GOOD in just about every way you can imagine. For one thing, the clock is twice as fast, at 2 megahertz, which makes the instructions run twice as fast. Memory, all 64K of it, is fast enough to keep up with computation with no waitstates or other kinds of fudging, which means that memory is at least twice as fast. For another thing, the disk transfer rate is twice as fast, because disk storage format is Double Density, which gets your software into and your results out of your Series 2000 Computer twice as fast. Having an extra CPU around to manage the keyboard/display helps performance, too, because the 6800 CPU doesn't have to worry about communications house-keeping. Communications with the console keyboard/display and the two RS-232 interfaces is handled in the most efficient possible manner...under Interrupt Control.

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Little things inside the Series 2000 Computer exist for the pleasure and convenience of those special people who do not simply use Computers but take them, make them into special forms, and then pass them on to others who use them as timesavers, as helpers, and as tools for

profit. Among these little things are I/O interfaces, right inside the machine, which permit attchment of3 physical and N logical devices to the very innards of the Series 2000 Computer. Through these connections the Series 2000 Computer may control, measure, test, time, start, stop, or merely converse with almost anything.

WHAT MORE CAN ONE SAY?

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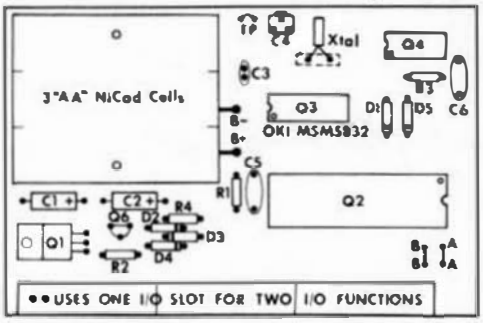

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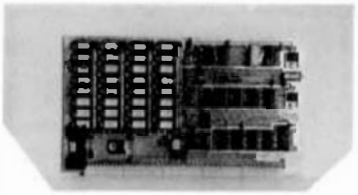

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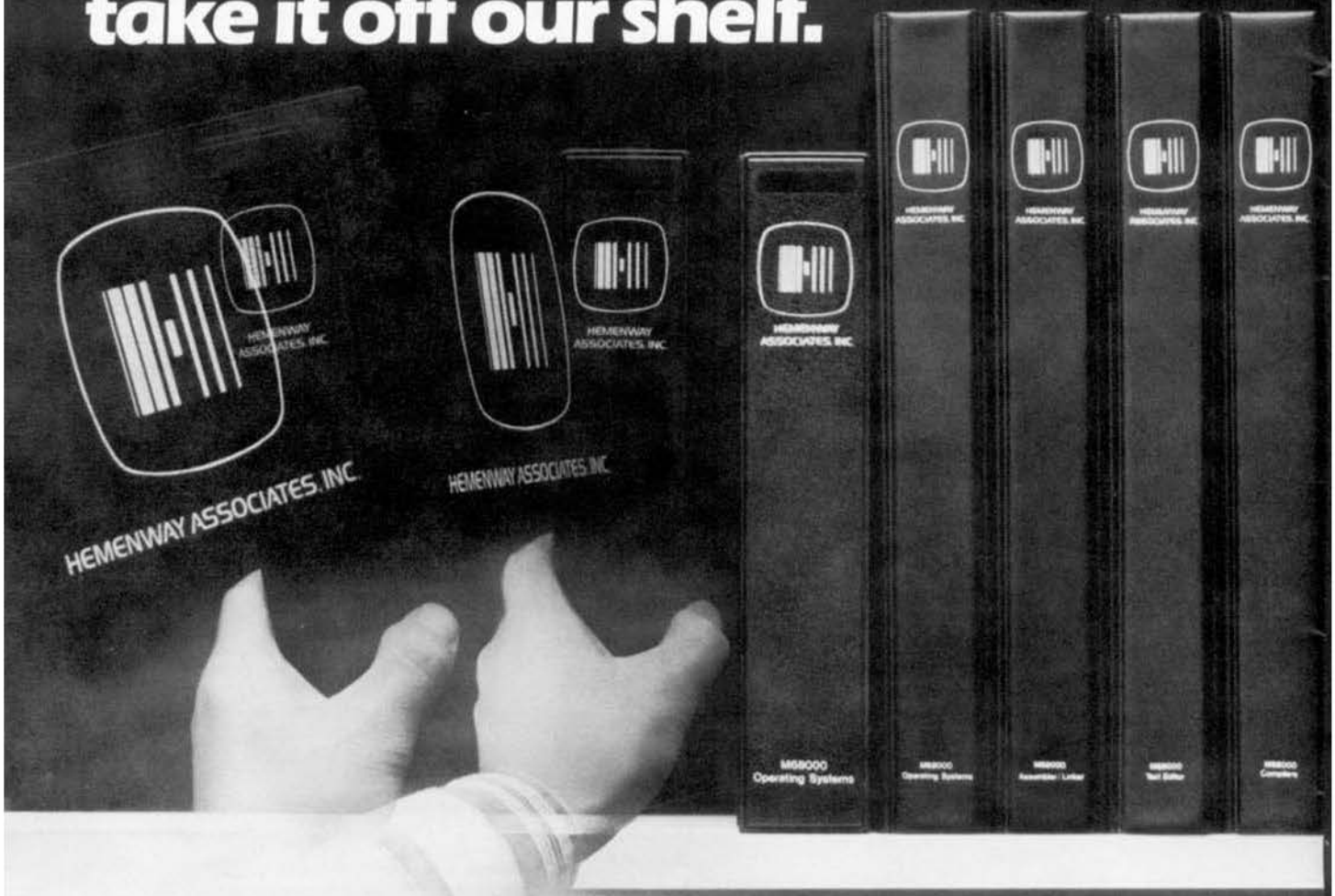

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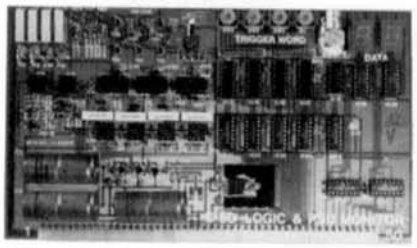

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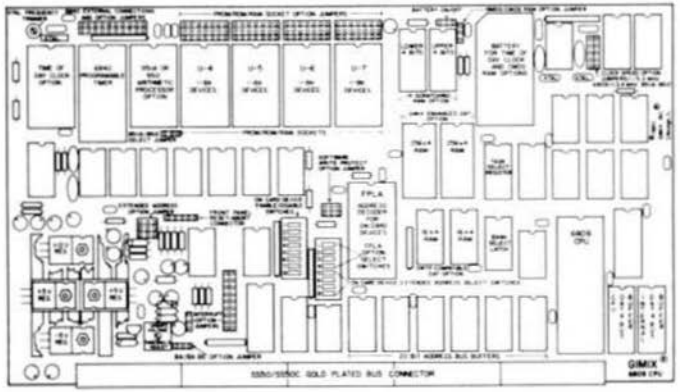

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- Software write protect in 4K blocks, of the entire address space (when GIMIX enhanced DAT is installed)
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GMXBUG 09 Manual and Source Listing Only	$ 38.62

(GMXBUG 09 does not require a Dynamic Address Translator. However, it can be used with your choice of either GIMIX or SWTPc DAT. Please specify version desired when ordering.)

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We know you hardcore bit hackers will recognize the computing power derived from combining the FORTH language with the 6809, today's most advanced 8 bit microprocessor.

And we know you'll understand this machine's 16 bit math, indirect addressing and two stacks are ideally suited for implementing **FORTH**.

But...should anyone need further convincing that **FORTH** provides a new dimension in power, speed and ease of operation, consider the following:

- It's a modern, modular, structured-programming high-level compiled language.
- It's a combined interpreter, compiler, and operating system.
- It permits assembler code level control of machine, runs near speed of assembler code, and uses less memory space than assembler code.
- It increases programmer productivity and reduces memory hardware requirements.
- It replaces subroutines by individual words and related groups of words called Vocabularies. These are quickly modified and tested by editing 1024-character text blocks, called screens, using built-in editor.

tFORTH is a basic system implemented for SS-50 buss 6809 systems with the TSC FLEX 9.0 disk operating system. It is available on 5¼" or 8" single density soft-sectored floppy disks. **$100.00**

tFORTH + consists of tFORTH plus a complement of the following FORTH source code vocabularies: full assembler, cursor controlled screen editor, case statements, extended data types, general I/O drivers. **$250.00**

firmFORTH is an applications package for use with tFORTH. It provides for recompilation of the tFORTH nucleus, deletion of superfluous code and production of fully rommable code. **$350.00**

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